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FINAL

Storm Sewer System Evaluation (AREE 70) Report

Base Realignment and Closure Environmental Evaluation (BRAC EE)
Fort Devens, Massachusetts

Volume I of II

Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
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Arthur D Little

Final Storm Sewer System Evaluation (AREE 70) Report

Base Realignment and Closure Environmental Evaluation (BRAC EE) Fort Devens, MA

Program Manager, Robert Lambe   Date

Task Manager, Richard Waterman   Date 6/27/94

Submitted to

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List of Acronyms and Abbreviations

ABB	ABB Environmental Services, Inc.
ADL	Arthur D. Little, Inc.
AOC	Area of Concern
AREE	Area Requiring Environmental Evaluation
AST	Aboveground Storage Tank
ATEC	ATEC Environmental Consultants, Inc.
BRAC EE	Base Realignment and Closure Environmental Evaluation
BTEX	Benzene, toluene, ethylbenzene, and xylene
CLP	Contract Laboratory Program
COR	Contracting Officer's Representative
CRL	Certified Reporting Limit
DDD	2,2-bis(p-chlorophenyl)-1,1-chloroethane
DDE	2,2-bis(p-chlorophenyl)-1,1-dichloroethene
DDT	2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane
DEH	Directorate of Engineering and Housing
DEP	Massachusetts Department of Environmental Protection
DOL	Department of Logistics
DOLMMD	Department of Logistics Material Maintenance Division
DPW	Directorate of Public Works
DQO	Data Quality Objective
DRMO	Defense Reutilization and Materials Organization
EMO	Environmental Management Office
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatograph
GIS	Geographic Information System
IRDMIS	Installation Restoration Data Management Information System
MAAF	Moore Army Air Field
MWAA	Maintenance and Waste Accumulation Area
NBC	Nuclear and Biological Center
NDIR	Non Dispersive Infrared Detector
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
ppm	Part per million
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenol
POL	Petroleum, Oil, and Lubricants
POTW	Publicly owned treatment works
PRI	Potomac Research Institute
POV	Privately Owned Vehicle
PX	Post exchange
QA/QC	Quality assurance/quality control

QAP	Quality Assurance Plan
QAPjP	Quality Assurance Project Plan
RPD	Relative percent difference
RTS/MED	Regional Training Site/Medical
SA	Study Area
SI	Site investigation
SOP	Standard operating procedure
STS	Sample Tracking System
SVOC	Semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TEPS	Total Environmental Program Support
TMDE	Time Measurement Diagnostic Equipment
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TQM	Total Quality Management
USAEC	U.S. Army Environmental Center
USAISD	U.S. Army Intelligence School Division
USARC	U.S. Army Reserve Center
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
UST	UndergroundsStorage tank
VOA	Volatile organic analyte
VOC	Volatile organic compound

Executive Summary

Fifty-five storm sewer systems and three surface water bodies were evaluated as part of the Base Realignment and Closure Environmental Evaluation (BRAC EE) at Fort Devens. These storm sewer systems were designated as Area Requiring Environmental Evaluation (AREE) 70. This AREE was identified after to the *Final Enhanced Preliminary Assessment, Fort Devens, Massachusetts, April 1992*. The purpose of this evaluation was to identify potential sources of contamination that were not identified through previous investigations. This evaluation also provides data on potential contaminant pathways that can be used to supplement other investigations/evaluations at Fort Devens. The 55 storm sewer systems and three surface water bodies were located on the Main and North Posts of Fort Devens. Each storm sewer system was route verified to identify the system's flow location and direction. All AREEs, Study Areas (SAs), and Areas of Concern (AOCs) associated with the storm systems were identified. Sediment and surface water samples were collected in locations that best captured potential upstream sources of contaminants.

A lognormal frequency analysis was applied to evaluate the data from the storm sewer systems. Analytes were selected for evaluation that best represent a cross-section of typical industrial contaminants. The lognormal frequency analysis indicated statistical outliers to the lognormal distribution of analytes. Systems with three or more statistical outliers of analytes selected for evaluation were identified as being systems of concern. These systems were determined to have a trend of potential contamination.

Ten systems were identified as being systems of concern. The systems located on the North Post were addressed as a group because of the consistent land use as an airfield. As a result of this analysis, no new potential sources of contamination have been identified. Furthermore, each system of concern already has AREEs, SAs, or AOCs associated with it. These AREEs, SAs, and AOCs are identified as potential sources of contamination and will be addressed throughout other studies. Systems #1 through #7, associated with the industrial activities at Barnum Road, are recommended for additional sampling to determine the extent of contamination at the outfall and points downstream. No further action is recommended for the systems on the North Post. The analytes detected at the North Post systems are consistent with the land use as an airfield since 1943. Four systems on the Main Post are recommended for confirmatory sampling because the analytes detected are not consistent with the surrounding land use.

Three surface water bodies systems were sampled during the AREE 70 evaluation: the central and north sections of the Nashua River, Cold Spring Brook, and Willow Brook. Analytes that best represented typical industrial contaminants were selected to identify whether individual storm sewer systems are contributing contaminants to the river or brook. Data collected from the Groups 2, 7 investigation, Groups 3, 5, and 6, and the Main Post SI were also evaluated along with the AREE 70 data. As a result of this evaluation, further sampling is recommended along a limited portion of Cold Spring Brook in conjunction with sampling in the storm sewer systems #1 through #7 from Barnum Road.

1.0 Introduction and Background

Task Order 0005, Fort Devens Base Realignment and Closure Environmental Evaluation (BRAC EE), was awarded to Arthur D. Little, Inc., by the U.S. Army Environmental Center (USAEC), formerly known as the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), under contract No. DAAA 15-91-D-0016.

Five sitewide Areas Requiring Environmental Evaluation (AREEs) were included in this BRAC EE:

- Maintenance and Waste Accumulation Areas (MWAAs) - AREE 61
- Previously Removed Underground Storage Tanks (USTs) - AREE 63
- Transformers - AREE 66
- Past Spill Sites - AREE 69
- Storm Sewer System Evaluation - AREE 70

AREEs 61, 63, 66, and 69 were outlined in the *Enhanced Preliminary Assessment (Enhanced PA), for Fort Devens, Massachusetts* (USATHAMA). This report addresses AREE 70, Storm Sewer System Evaluation. Fifty-five separate storm sewer systems were evaluated on Fort Devens's Main and North Posts. In addition, three surface water bodies were evaluated: Cold Spring Brook, Willow Brook, and the central and north sections of the Nashua River. This study includes investigating the flow routes of all 55 systems, and sampling the storm sewer systems and the surface water bodies. The AREE 70 evaluation was added to the other AREE evaluations to assist in identifying potential sources of contamination that have not been previously identified as potential Study Areas (SAs), AREEs, or Areas of Concern (AOCs). Addendum 1 to this report discusses the sampling approach and results of the surface water sampling.

1.1 Background/Previous Studies

A final Enhanced PA was submitted in 1992 to address areas not normally included in the CERCLA process but requiring review prior to closing Fort Devens. The primary focus of the Enhanced PA was to identify AREEs. During 1993, Arthur D. Little evaluated four AREEs to determine whether further investigation was necessary. The storm sewer evaluation, AREE 70, was not included as a part of the Enhanced PA.

Approximately 86 storm sewer collection and discharge systems were identified at Fort Devens. These systems were identified as part of engineering studies conducted by Fort Devens or by USAEC review of Geographic Information System (GIS) maps. Of these 86 systems, 55 systems were included in this evaluation. In addition, three surface water bodies, the Nashua River, Cold Spring Brook, and Willow Brook, were evaluated.

The 55 systems included in this evaluation were selected to encompass storm sewer systems that drain the locations at Fort Devens where base operations could adversely impact the environment. Systems were selected where AREEs, SAs, and AOCs may potentially discharge directly to the drainage system. The major storm systems associated with housing areas were also included in the evaluation. The 31 systems not included in the evaluation are small systems that drain limited areas. These 31 systems did not have any sources of potential contamination associated with them.

The AREE 70 evaluation was conducted concurrently with four other AREE evaluations: AREE 61 Maintenance and Waste Accumulation Areas, AREE 63 Previously Removed Underground Storage Tanks, AREE 66 Transformers, and AREE 69 Past Spill Sites. Draft reports for each of these AREEs were prepared in the fall of 1993. In addition, the following reports were consulted: *Fort Devens Site Investigation Groups 2, 7, and Historic Gas Stations Final Investigation Report,* (USAEC, May 1993) and the *Fort Devens Groups 3, 5, and 6 Site Investigation Data Package* (USATHAMA, December 1992).

1.2 Project Objectives

The primary objective of the AREE 70 Storm Sewer System Evaluation was to identify additional potential sources of contamination that have not been previously identified through the Enhanced PA process. Selected storm sewer systems were evaluated to determine whether they are acting as potential pathways for contaminant and/or hazardous substance releases to the environment. An additional objective of this evaluation was to provide data on potential contaminant pathways that can be used in support of additional investigations being conducted at Fort Devens. The AREE 70 Evaluation was not intended to be conducted in support of Clean Water Act compliance activities. Therefore, sampling methodology did not follow National Pollutant Discharge Elimination System (NPDES) sampling protocols.

To complete this study a combination of records review, review of planning and engineering drawings, interviews, and route verification techniques was used to determine the storm sewer system locations. Both sediment and surface water samples were collected at both internal locations and at system outfalls to determine the presence of contamination in the sewer system and attempt to identify the source

of the contamination, if any. Analytical results from each system were evaluated against the results from the other systems using a statistical approach to identify potential systems of concern. The analytical results were also compared to land use around the system and compared qualitatively against AOCs, SAs, and AREEs associated with each system.

1.3 Data Quality Objectives

Data Quality Objectives (DQOs) were defined to ensure that the collected data will be of adequate quality to support the decision making needs of the USAEC. In order to provide a common point of reference for all projects and ensure comparability of the data generated within the USAEC, the use of standardized analytical methods that provide sufficient information to evaluate data quality is prescribed by the USAEC. For specific methods, the USATHAMA *Quality Assurance Program* (1990) defines DQOs through a process of method performance demonstration, including pre-performance demonstrated calibration and performance demonstrated analyses. The USAEC Chemistry Branch determines whether the results of these analyses demonstrate proficiency of the laboratory and, if proficiency is demonstra-ted, assigns method numbers to be used when reporting data. This effort also provides the baseline for establishing control limits for daily analyses. Where possible, USAEC performance demonstrated analytical methods were used for the analysis of Fort Devens samples; for non-USAEC methods, analyses were performed based on standard EPA methods.

A U.S. Army Corps of Engineers Missouri River Division (MRD) validated laboratory, DataChem Laboratories, was used to perform all analyses on the field samples collected at Fort Devens. All analytical methods used for Fort Devens investigations will generate appropriate quality control (QC) data to enable data quality to be assessed with respect to the DQOs of the project. The data quality objectives outlined for this evaluation were satisfied.

USAEC analytical methods are characterized by rigorous quality assurance/quality control (QA/QC) protocols and documentation requirements. The USAEC performance demonstrated methods used for Fort Devens investigations are presented in Appendix A. The Target Analyte List (TAL) of metals and Target Compound List (TCL) of volatile and semivolatile organic compounds are defined by the EPA Contract Laboratory Program (CLP). The specific constituents analyzed as part of these multi-analyte methods and other multi-analyte methods, gas chromatography/electron capture detector polychlorinated biphenyls, are provided in Appendix A. Non-USAEC methods used during Fort Devens investigations are also presented in Appendix A. These analyses were performed using EPA or other published methods, with specified QA/QC requirements. Field screening

measurements were collected using portable equipment in order to provide real-time data to assist in the optimization of the field sampling activities and to ensure health and safety protection. Field measurements such as pH, temperature, conductivity, and turbidity were recorded also.

Tables 1-1 and 1-2 present the DQOs for critical measurements in terms of precision, accuracy, and completeness for all parameters analyzed for this investigation. The tables specify whether the measurement is made in the field or in the laboratory. Estimated accuracy is expressed as percent recovery and estimated precision is expressed as a relative percent difference (RPD) (for two values) or a standard deviation (for three or more values). Completeness is expressed in terms of the percentage of valid data generated out of the total number of data points. The information regarding precision and accuracy of the methods has been obtained from a number of sources. For the EPA methods used in this investigation, the precision and accuracy values come from a program for evaluating analytical methods and laboratories that is directed by the EPA. For the USAEC performance demonstrated methods, precision and accuracy are evaluated as part of the control chart program. All of these indicators of data quality are explained in detail below.

Precision. Precision is the degree of mutual agreement among individual measurements of the same parameter, using prescribed conditions and a single-test procedure. Overall, precision includes variability associated with field and laboratory operations. The results of analyzing field duplicate samples are used to assess field variability, which is a function of sample collection/handling as well as matrix homogeneity. Analytical precision can be expressed in several ways, including standard deviation, relative standard deviation, range, and RPD.

- For the USAEC performance demonstrated methods, laboratory precision is evaluated as part of the control chart program. A three-day moving average control chart is maintained for each control analyte by plotting the range of recovery of spiked QC samples; an updated three-day average range of recovery for each compound is plotted on the control chart as part of the daily laboratory control program. This procedure is intended to monitor variations in the precision of routine analyses and detect trends in observed variations.

- For non-USAEC methods, laboratory precision is generally assessed through the use of laboratory duplicate samples or as specified in the method.

Accuracy. Accuracy is the difference between individual analytical measurements and the true or expected value of a measured parameter. It is a measure of the bias corresponding to systematic and random errors in the entire data collection process. Sources of error include the sampling process, field and laboratory contamination, sample preservation and handling, sample matrix interferences, sample preparation

methods, and calibration and analysis procedures. Sampling accuracy can be assessed, in part, by evaluating the results of analyzing field/trip blanks; analytical accuracy can be evaluated through the use of calibration and method blanks, calibration verification samples, laboratory control samples, and matrix spikes.

- For the USAEC performance demonstrated methods, accuracy is assessed as part of the control chart program. A three-day moving average control chart is maintained for each control analyte by plotting the recovery of spiked QC samples; an updated three-day average recovery for each compound is plotted on the control chart as part of the daily laboratory control program. This procedure is intended to monitor variations in the accuracy of routine analyses and detect trends in the observed variations.

- For non-USAEC methods, laboratory accuracy is generally assessed through the use of laboratory spiked samples or as specified in the method.

Representativeness. Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variation at a sampling point, or an environmental condition. A representative sample should possess the same qualities or properties relevant to the investigation as the material under investigation. Representativeness reflects the design of the sampling program; representativeness is maximized by proper selection of sampling locations and collection of a sufficient number of samples. Sampling locations for the AREE 70 evaluation used a targeted sampling design. Parameter variations at a sampling point can be evaluated on the basis of field duplicate results.

Completeness. Completeness is defined as the measure of the amount (%) of valid data obtained from a measurement system, either field or laboratory, compared to the amount expected from the system. Completeness is assessed in terms of the actual number and type of sample results received from the laboratory compared with the planned number and type of results. A target of 90 percent completeness for all field and laboratory data is expected for Fort Devens investigations.

Comparability. Comparability addresses the confidence with which one data set can be compared to another. Use of appropriate sampling methods, chain-of-custody procedures, and USAEC performance demonstrated and EPA-approved analytical methods, as well as adherence to strict QA/QC procedures, provide the basis for uniformity in sample collection and analysis activities.

For the AREE 70 evaluation, data are considered valid with respect to the comparability objectives if the USAEC acceptance criteria for precision, accuracy, and any other method-specified quality criteria are achieved. Work was conducted under the USAEC requirements for field sampling activities and laboratory analysis.

To the extent possible, USAEC performance demonstrated methods were used in a USAEC performance demonstrated laboratory. For non-USAEC analyses, USAEC requirements were followed for using standardized methods with appropriate QA/QC protocols to generate data of known quality.

In addition, comparability is assured through the consistent use of units. The data collected as part of this program were entered into IRDMIS in the units presented in Appendix A.

1.4 Project Approach

1.4.1 Management Plan

A Draft and Final Management Plan was submitted on August 12, 1993. This plan described the management approach for this project, and identified the major project tasks and described resource allocations, including subcontractors for each task. An organizational chart and supporting narrative indicating program management and the assignment of functions, duties, and responsibilities was included. The plan defined direct lines of control, responsibilities, functional relationships, and authority between all organizational elements including the government and subcontractors. The plan included a narrative description of the technical approach to be employed to accomplish all contractual tasks and a project schedule with major milestones, deliverables list, staffing plan, and communications plan.

1.4.2 Work Plan

Appendix B to the Supplemental Work Plan was submitted on June 30, 1993. This appendix addressed the field effort and procedures conducted during the AREE 70 Storm Sewer Evaluation. The Final Work Plan was submitted June 17, 1994. Background information acquired during the initial site visit was incorporated into the Work Plan. The plan presented the sampling objectives and rationale, sample locations, sample type, sample analyses, and sample designations for all elements of the field investigation. The Work Plan also discussed the sampling methodologies and approach.

1.4.3 Quality Assurance Project Plan

Supplement B to the Final Quality Assurance Project Plan (QAPjP) for Fort Devens was submitted on June 30, 1993. This supplement covered the sampling and analyses associated with the AREE 70 Storm Sewer Evaluation. The QAPjP addressed activities associated with investigations, evaluations, and studies at Fort Devens. The QAPjP was developed to comply with the requirements of *USATHAMA Quality Assurance Program*, PAM 11-41, Revision No. 0, January 1990.

The objective of the *USATHAMA Quality Assurance Program* is to establish a QA system and proper QC procedures. The *USATHAMA Quality Assurance Program*

defines QA as "the system whereby an organization provides assurance that monitoring of quality related activities has occurred" and QC as "specific actions taken to ensure that system performance is consistent with established limits. It is these actions which ensure accuracy, precision, and comparability of results." The QAPjP addresses a broad range of quality assurance issues at Fort Devens. The QAPjP, with the delivery order-specific supplements, was developed to address QA/QC activities. These activities ensure that the results of the field investigation program are properly documented and of adequate quality to support decisions about the necessity for and nature of further investigations and remedial actions.

A subcontracted USAEC performance demonstrated laboratory, DataChem Laboratories of Salt Lake City, Utah, performed chemical analyses of samples collected during the Fort Devens investigation. DataChem's Quality Assurance Program Plan, which was attached to the QAPjP, describes specific laboratory QA/QC activities, while the QAPjP describes Arthur D. Little QA/QC activities, including sufficient details to assure, through reviews, that laboratory results meet USAEC requirements.

1.4.4 Health and Safety Plan

Supplement B to the Final Health and Safety Plan (HASP) for Fort Devens was submitted on June 30, 1993. The HASP was prepared for the use of Arthur D. Little field personnel during work at Fort Devens. This HASP also provides minimum requirements for subcontractors employed by Arthur D. Little for site investigation tasks and authorized on-site visitors. Supplements to the HASP provide information specific to each delivery order, including Supplement B for the AREE 70 Storm Sewer Evaluation. The overall purpose of this HASP is to provide on-site personnel with the required procedures needed to ensure safe working conditions. The HASP outlines personnel protection standards and mandatory safety practices, procedures, and contingencies that apply while the tasks in the scope of work are being performed. The safety organization and procedures in this plan were established based on an analysis of potential site hazards.

All work was conducted in accordance with applicable federal, state, and local regulations, including the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) requirements of 29 CFR 1910 and 1926. This plan is primarily intended to satisfy the requirements set forth by OSHA in the Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). Other workplace standards or guidelines were used in lieu of OSHA standards when they are more stringent than OSHA standards or when no OSHA standard exists. Examples of such guidelines include recommendations proposed by the American Conference of Governmental Industrial Hygienists (ACGIH), the National Institute of Occupational Safety and Health (NIOSH), and existing U.S. Army standards (e.g., EOD). The most recent copy of the Arthur D. Little Hazardous Waste Site

Health and Safety Program Plan (April 6, 1992) was the reference document for other Arthur D. Little-specific health and safety policies and procedures regarding work at hazardous waste sites.

1.5 Project Organization and Responsibilities

This section describes the general organizational structure for the AREE 70 Storm Sewer System Evaluation. This section provides the overall assignment of responsibility for all aspects of the project and the functional and communication relationships among the organizational elements participating in this project. The roles and responsibilities of key project team personnel are described below.

1.5.1 Project Organization

1.5.1.1 Program Manager. Dr. Robert N. Lambe is the Arthur D. Little Program Manager for the USAEC Total Environmental Program Support (TEPS) contract. He is responsible for monitoring technical progress; reviewing and approving all work products; reviewing and approving all deliverables before submission to USAEC; monitoring financial and schedule control; and instituting corrective action, if necessary.

1.5.1.2 Task Manager. Mr. Richard W. Waterman is the Arthur D. Little Task Manager for the BRAC EE and works directly with Dr. Lambe. As Task Manager, his responsibilities include project staffing and direct management of all staff assigned to the Delivery Order; maintaining direct financial and schedule control; reviewing and approving all deliverables; recommending corrective actions, if necessary, to the Program Manager; and maintaining a liaison with the USAEC Contracting Officer's Representative (COR) and Fort Devens Environmental Office Manager. In this role, the Task Manager is responsible for ensuring that the USAEC COR and the Fort Devens BRAC Environmental Coordinator (BEC) are kept informed of all technical progress as necessary.

1.5.1.3 Task Staff. Subtask Managers are assigned to specific Delivery Orders as required by the scope of work.

The Subtask Managers are responsible for coordinating all phases of activities required to complete the stated goals of their subtask assignment, including tracking and reporting on technical quality, schedule, budget, deliverables, problems, and corrective actions. Subtask Managers are responsible for ensuring that the Task Manager is kept informed of all technical progress and potential problem areas. Consistency in approach for each subtask is assured through management by the Task and Subtask Managers, brief weekly meetings, and use of a common resource base to

perform the specific work assignments. Technical staff members take direction from the Subtask Managers.

Field activities were managed by the Deputy Task Manager, Mr. Anthony Parkin. During on-site field investigations at Fort Devens, the field teams include a site coordinator, who may be the Subtask Manager or his/her designee, and a designated on-site Health and Safety supervisor. Field engineers and technicians reported to the site coordinator.

Laboratory activities were overseen by the Lead Chemist, Mr. Hilton Rivera. He or his designee is responsible for coordinating field and laboratory activities, and reviewing the operations and data files/packages of our subcontracted laboratory, DataChem.

1.5.2 Arthur D. Little QA/QC Organization

The principal individuals responsible for implementing the requirements of the QAPjP are the managers and staff for the AREE 70 Storm Sewer System Evaluation. In addition, however, we have assigned QA/QC oversight, review, and reporting responsibilities to the Program QA Officer and the Lead Chemist, in addition to specific responsibilities for QA in our subcontracted laboratory. These responsibilities are described below.

1.5.2.1 Program QA Officer. Arthur D. Little's Total Quality Management (TQM) Program is under the direction of Dr. Alfred E. Wechsler, Senior Vice President and Chief Professional Officer. Dr. Wechsler selected Mr. Stuart Canton as the Program Quality Assurance Officer for the USAEC TEPS contract. In his role as an independent evaluator of Arthur D. Little's performance during this Delivery Order, Mr. Canton reports directly to Dr. Wechsler. If needed, as directed by Dr. Wechsler, he also has the authority to discuss QA/QC issues with officials at USAEC and other Army officials in the chain of command. Mr. Canton's findings and recommendations are communicated directly to the Program Manager, the Task Manager, and Dr. Wechsler during the course of this Fort Devens Delivery Order.

The primary focus of the Project QA Officer is to ensure that systems are in place and adequate to maintain the maximum level of quality throughout all aspects of the project.

Specific functions and duties of the Program QA Officer include:

- Reviewing and approving QA policies and procedures
- Reporting the adequacy, status, and effectiveness of the QA program on a regular basis to the program management

- Maintaining responsibility for documentation of corporate QA records, documents, and communications
- Conducting field audits
- Coordinating with the Lead Chemist to ensure QC procedures specific to the laboratory and data management are followed and documented

The purpose of the field audits is to ensure that sampling and related activities are conducted in a manner consistent with the QA Program and other USAEC guidelines. This responsibility includes visiting the site to inspect sampling where applicable. The Program QA Officer documents (Appendix U of the *USATHAMA Quality Assurance Program*, January 1990) each inspection and ensures that procedures described in the Scope of Work Project Work Plan and QAPjP are followed. The Program QA Officer has the authority to require resampling of any site whose sampling integrity was determined to have been affected by faulty sampling procedures, after obtaining approval from the USAEC Project Officer or the COR.

1.5.2.2 Lead Chemist. Arthur D. Little's Lead Chemist, Mr. Hilton Rivera, assists with oversight of the laboratory activities for this project. Specific functions and duties include:

- Maintaining copies of our subcontracted laboratory documentation, including USAEC performance demonstrated methods and QA Plans

- Providing an external and, thereby, independent QA review of our subcontracted laboratory's activities and documentation (including all control charts and a 10 percent review of data packages and IRDMIS data files)

- Coordinating with USAEC, Arthur D. Little, and DataChem to ensure that DQOs appropriate to the project are established and that DataChem personnel are aware of these objectives

- Coordinating with DataChem management and personnel to ensure that QC procedures that are appropriate to demonstrating data validity and sufficient to meet DQOs are developed and in place

- Ensuring data are properly reviewed by an Arthur D. Little QA chemist

- Requiring and/or reviewing corrective actions taken in the event of QC failures

- Reporting non-conformance with QC criteria or DQOs, including assessing the impact of the data quality or project objectives, to the Program QA Officer and Task Manager

1.5.3 DataChem Project QA/QC Organization

The DataChem laboratory organization is described in the DataChem QA Program Plan, Section 3, Organization and Responsibilities, provided in Appendix A to the QAPjP.

The DataChem Analytical Task Manager is Mr. James H. Nelson. Mr. Nelson maintains overall responsibility for providing Arthur D. Little with the appropriate laboratory qualifications and QC documentation and assuring the proper scheduling and performance of each project assignment.

The DataChem QA Coordinator is Mr. Lance H. Eggenberger. Mr. Eggenberger maintains overall responsibility for DataChem's QA/QC Program and monitors all laboratory QA/QC activities for compliance with USAEC and Arthur D. Little requirements.

1.6 AREE 70 Storm Sewer System Evaluation Report Organization

This Draft AREE 70 Storm Sewer System Evaluation Report documents the methods and activities performed during the evaluation of the storm sewer systems on Fort Deven's Main and North Posts. Storm sewer system sampling results were evaluated to determine whether there are any potential sources of contamination not identified in previous investigations at Fort Devens. This report provides a foundation that supplemental investigations can use to help guide investigation tasks.

The report is organized into five sections. Section 1.0 provides the introduction to the report. Section 2.0 summarizes the AREE 70 evaluation, including field investigation procedures, analytical program, and data management. Section 3.0 presents the description of each storm sewer system, sample locations, sample results and associated land use. Section 4.0 presents the statistical analyses of the sampling data and identifies the storm sewer systems with elevated concentrations of contaminants as compared to other systems that were sampled. Section 4.0 also provides a correlation between the storm sewer systems, associated land use, and associated AOCs, SAs, and AREEs. Section 5.0 presents conclusions and recommendations for those systems determined to have elevated concentrations of contaminants. Addendum 1 to the report discusses the purpose, scope, approach, sample results, and recommendations for the sampling of Willow Brook, Cold Spring Brook, and the Nashua River. Figures and tables are provided at the end of each section.

The appendices provide supporting information, including the project analyte list, laboratory QC results, surface water quality results, and statistical tables. A computer disk containing all analyte information is also provided at the end of the report. This report contains two volumes.

Table 1-1: Data Quality Objectives for USAEC-Performance Demonstrated Methods: Precision, Accuracy, and Completeness

Lab/Field QC[a]	Parameter	Matrix	Estimated Accuracy[b,c]	Estimated Precision[b,c]	Field Duplicates RPD-DQO	Completeness
Lab USAEC	TCL VOAs	Soil/Sed	80-120%	≤20%	RPD ≤30%	90%
Lab USAEC	TCL SVOAs	Soil/Sed	60-140%	≤25%	RPD ≤30%	90%
Lab USAEC	TAL Metals	Soil/Sed	80-120%	≤20%	RPD ≤30%	90%
Lab USAEC	TCL Pesticides/PCBs	Soil/Sed	70-120%	≤25%	RPD ≤30%	90%
Lab USAEC	TCL PCBs	Soil/Sed	70-120%	≤20%	RPD ≤30%	90%
Lab USAEC	Organophosphorous Pesticides	Soil/Sed	70-120%	≤25%	RPD ≤30%	90%
Lab USAEC	HPLC Explosives	Soil/Sed	80-120%	≤20%	RPD ≤30%	90%
Lab USAEC	Nitrate	Soil/Sed	80-120%	≤20%	RPD ≤30%	90%
Lab USAEC	Sulfate	Soil/Sed	80-120%	≤20%	RPD ≤30%	90%
Lab USAEC	Herbicides	Soil/Sed	60-110%	≤25%	RPD ≤30%	90%
Lab USAEC	TCL VOAs	Aqueous	80-120%	≤20%	RPD ≤30%	90%
Lab USAEC	TCL SVOAs	Aqueous	60-140%	≤25%	RPD ≤30%	90%
Lab USAEC	TAL Metals	Aqueous	90-110%	≤10%	RPD ≤30%	90%
Lab USAEC	Chloride	Aqueous	90-110%	≤10%	RPD ≤30%	90%
Lab USAEC	Nitrate	Aqueous	90-110%	≤10%	RPD ≤30%	90%
Lab USAEC	Sulfate	Aqueous	90-110%	≤10%	RPD ≤30%	90%
Lab USAEC	Explosives	Aqueous	70-110%	≤20%	RPD ≤30%	90%
Lab USAEC	TCL Pesticides/PCBs	Aqueous	80-120%	≤20%	RPD ≤30%	90%
Lab USAEC	Organophosphorus Pesticides	Aqueous	80-120%	≤20%	RPD ≤30%	90%
Lab USAEC	Herbicides	Aqueous	60-110%	≤25%	RPD ≤30%	90%
Lab USAEC	Total Kjeldahl Nitrogen	Aqueous	90-110%	≤10%	RPD ≤30%	90%
Lab USAEC	Total Phosphorous	Aqueous	90-110%	≤10%	RPD ≤30%	90%

a. USATHAMA, Quality Assurance Program, January 1990

b. For these USAEC-certified methods, the precision and accuracy limits will be based on the historical control chart data of DataChem Laboratories.

c. Values represent an average for the analyte group. Individual analyte behavior can significantly impact precision and accuracy. Low spike quality control samples tend to exhibit poorer precision and accuracy.

RPD: Relative Percent Difference.

Table 1-2: Data Quality Objectives for Non-Performance Demonstrated Methods: Precision, Accuracy, and Completeness

Lab/Field QC	Parameter	Matrix	Estimated Accuracy[a]	Estimated Precision[a]	Completeness
Lab Non-USAEC[a]	Hydrocarbons	Soil/Sed	50 - 120%	RPD ≤75%[c]	90%
Field Non-USAEC[a]	pH	Aqueous	±0.2 pH units	±0.2 pH units[c]	90%
Field Non-USAEC[a]	Temperature	Aqueous	±1°C	±1°C[c]	90%
Field Non-USAEC[a]	Conductivity	Aqueous	±2% scale	±2% scale[c]	90%
Field Non-USAEC[a]	Turbidity	Aqueous	±2% scale	±2% scale[c]	90%
Lab Non-USAEC[b]	TCL Volatile Organics	TCLP Extract[d]	75-125%	RPD ≤20%	90%
Lab Non-USAEC[b]	TCL Pesticides	TCLP Extract[d]	70-120%	RPD ≤20%	90%
Lab Non-USAEC[b]	TCL Semivolatile Organics	TCLP Extract[d]	60-140%	RPD ≤25%	90%
Lab Non-USAEC[b]	TCL Herbicides	TCLP Extract[d]	60-110%	RPD ≤25%	90%
Lab Non-USAEC[b]	TAL Metals	TCLP Extract	±15%	RPD ≤10%	90%
Lab Non-USAEC	Phosphate	Aqueous	80-120%	RPD ≤20%	90%
Lab Non-USAEC	Phosphate	Soil/Sed	70-130%	RPD ≤20%	90%
Lab Non-USAEC	TPHC	Aqueous	60-120%	RPD ≤75%[c]	90%
Lab Non-USAEC	Hardness	Aqueous	80-120%	RPD ≤15%	90%
Lab Non-USAEC	Alkalinity	Aqueous	80-120%	RPD ≤15%	90%
Lab Non-USAEC	Total Organic Carbon	Soil/Sed.	80-120%	RPD ≤15%	90%
Lab Non-USAEC	Total Suspended Solids	Aqueous	80-120%	RPD ≤15%	90%

a. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983 and EPA Water Pollution Performance Evaluation Data

b. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, January 1990

c. RPD-DQO is for the analysis of field duplicates.

d. See Method 1311 from *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, SW-846, 3rd Edition, January 1990.

2.0 Storm Sewer System Evaluation Program Summary

The following subsections summarize the elements of the AREE 70 Storm Sewer System Evaluation, including the field investigation procedures, analytical program (Subsection 2.1), and chemical data management (Subsection 2.2).

2.1 Storm Sewer Evaluation Procedures

Each storm sewer system was evaluated by reviewing information regarding the associated land use, AOCs, SAs, and AREES; engineering drawings; route verification; and, by sampling surface water and sediments. The following subsections discuss the techniques used to evaluate each storm sewer system.

2.1.1 Data Review

Information regarding storm sewers on Fort Devens was reviewed to help identify all storm sewer systems and identify the major drainage systems. A review of available documentation regarding the storm water collection systems was conducted to verify existing storm sewer routes and determine general system conditions, as well as identify potential sampling locations. Documents reviewed included construction and as-built drawings, previous utility system studies, topographic site maps, and aerial photographs. Furthermore, past investigation reports were reviewed to identify potential AOCs, SAs, and AREEs that may be associated with each storm sewer system. Information gathered during the review of maintenance and waste accumulation areas (AREE 61) was reviewed to assist in determining the location of storm sewers. In addition, interviews were conducted with personnel in the Fort Devens Environmental Management Office (EMO) and Directorate of Public Works (DPW) to help verify storm sewer routes for which documentation was not available.

Previous site investigations (SIs) and remedial investigations (RIs) that included sampling in storm sewers or adjacent rivers were also reviewed. If information gathered during this evaluation indicated a potential for contaminants reaching the storm sewer system, sampling was focused downstream of those points. Internal sampling points were also located based upon information gathered during the review of reports for the following AREEs: maintenance and waste accumulation areas (AREE 61), previously removed underground storage tanks (AREE 63), transformers (AREE 66), and past spills (AREE 69). If there was an indication that contaminants reached the storm sewer, sampling was focused downstream to determine whether contaminants were still present in the system. Sample points were also located to best represent the contribution of potential contaminants from upstream sources that may not be associated with AOCs, SAs, or AREEs (e.g., holding areas, National Guard operations).

Approximately 86 storm sewer collection and discharge systems were identified at Fort Devens. Of these, 55 systems were included in this evaluation. These 55 systems were chosen to include storm sewer systems that drain the locations at Fort Devens where base operations could adversely impact the environment. Furthermore, systems were chosen that have associated AOCs, SAs, and AREEs that may have the potential to discharge directly to the storm sewer system. In addition, the major storm sewer systems associated with the housing areas were included. Small systems or systems draining a limited area were not included. Three surface water bodies, the Nashua River, Cold Spring Brook, and Willow Brook, were also evaluated as part of AREE 70. The results of the evaluation of surface water bodies are included in Addendum 1 to this report.

2.1.2 Route Verification

The Supplemental Work Plan Appendix B indicated that 18 of the 55 storm sewer systems needed route verification through dye testing. In practice, one or a combination of three route verification methods were used on each storm sewer system. The first route verification method was used to physically verify the system's drainage route. Each storm sewer system was verified by visually tracing the system. This was accomplished by walking the system and following the drainage pipe upstream. If necessary, a second step was to introduce water to the system at a low velocity. If the first two methods did not confirm routing, a water and dye mixture was introduced to the system to verify the system's drainage. The following is a more detailed description of the route verification process:

- The outfall from each system was identified.

- Working from the outfall to upstream locations, the system's drainage routes were confirmed by opening manholes and determining the direction of flow.

- Points in the system, such as manholes, catch basins, headwall inlets, etc., were identified and measured to known points along the route. Schematic plans were drawn in the field notebooks.

- In cross country routes, or areas where there were no known points to locate the system, limited ground surveys were conducted. This included measuring distances between manholes using a surveyor's tape or other measuring method and turning angles at changes in pipe/drainage area direction to provide a more accurate drawing of the system.

- For areas where there were questions as to the direction of flow, or insufficient access to the storm sewer systems, route verification was accomplished through introducing water into the storm sewer or conducting dye testing. To introduce water into the system, the field teams coordinated with the Fort Devens EMO

and Fort Devens Fire Department, as necessary, to introduce water (via fire hose or by other means) into the storm sewer to locate the flow route of the system. Water was injected at a known point in the system at a low velocity to indicate an outfall or connection point. The flow velocity was controlled to avoid scouring of sediments within the system. Suspected manholes downstream in the system were opened and the water flow was observed by shining a flashlight down the manhole and observing the flow. This process was repeated until the entire system route was verified.

- If the storm sewer route could not be verified through introducing flow into the system, dye testing was conducted. Dye testing involves placing fluorescent dye into an accessible point in the system and flushing the system with water. Powdered yellow-green dye visible to one part per million (ppm) was used. This dye is readily dissolved in water and quickly breaks down in the natural environment when exposed to sunlight. A manhole at the suspected downstream location was opened to determine if the dye appeared in the system. The dye was detected by shining a high intensity flashlight down the manhole and observing the yellow-green dye color. If the dye did not show at the suspected location, a different location was identified and the process repeated.

2.1.3 Storm Sewer System Sampling

Sampling of the storm sewer systems included in this evaluation was conducted during August and September, 1993. Both surface water and sediment samples were collected. Storm sewer systems were sampled at both outfall and internal locations. Internal sampling locations included manholes, catch basins, and drainage swales and ditches. Most outfall sampling locations were identified by an outfall pipe or headwall. As discussed in Section 3.0, two systems (originally proposed for sampling) systems #3 and #4 were combined with other systems and one system, system #13, was removed from this evaluation. As a result, 52 systems rather than 55 systems were sampled. Because of an abnormally dry summer season, a number of sample locations proposed for water sampling could not be sampled because there was no water in the system. If no water was present, sediment samples were collected. If the sewer system had standing water, the standing water was sampled.

Sample locations were chosen to ensure that samples could be collected that were representative of upstream conditions. Sample points were located downstream of any AOCs, SAs, or AREEs associated with the system. Sample locations were selected after route verification was completed to ensure that the flow direction would capture flow from upstream sources. Sample analyte suites were selected to ensure that compounds representative of upstream sources would be analyzed. The following sections discuss the sampling methods and techniques used during the AREE 70 evaluation.

2.1.3.1 Sediment Sampling Procedures. Each sediment sample was collected in accordance with standard operating procedure (SOP) ADL-1024, as summarized below:

- All equipment used to collect samples was cleaned before use and between samples in accordance with SOP USA-1008.

- The position of the sampling point was identified and recorded. Records included detailed sketches of each sample location for future reference. Each location was also plotted on the site basemap.

- Samples were collected using either a decontaminated stainless steel hand auger or a weighted stainless steel dredge (ponar type).

- Because sample points within systems were relatively distant to each other, the direction of sampling (downstream vs. upstream) was unimportant. Surface water samples were collected prior to sediment samples at the same location, if water was present.

2.1.3.2 Surface Water Sampling Procedures. Surface water samples were collected in conformance with the procedures set forth in SOP USA-1001, as summarized below:

- All equipment used to collect samples was decontaminated prior to use and between sample collection in accordance with SOP USA-1008.

- Records included detailed sketches of each sample location for future reference. Each location was also plotted on the site basemap.

- Samples were collected by direct submergence of the sample containers.

- The pH, temperature, specific conductivity, and turbidity of each surface water sample were measured immediately prior to collection.

- All sample containers and lids were triple rinsed with the sampled surface water prior to filling.

- Preservatives were added to the sample following rinsing, or were added following sample collection.

2.1.4 Decontamination

All equipment decontamination procedures were performed in accordance with SOP USA-1008. Smaller equipment such as dredge samplers and composite bowls were

decontaminated using USAEC-approved laboratory grade distilled water. The decontamination process included a triple rinse with distilled water. Liquinox detergent was approved by the USAEC for decontamination of heavily contaminated sampling equipment.

All decontamination fluids were field screened for total volatile organic emissions using a calibrated Photovac MicroTIP photoionization detector. No emissions of 10 ppm or greater were recorded during the screening of the decontamination fluids. Therefore, all decontamination fluids were disposed of at locations where small equipment decontamination was performed.

2.2 Data Management

Data management for Fort Devens consisted of sample tracking, chain-of-custody protocol, and the management of map and chemical data. Activities included the creation and maintenance of a series of program-wide databases, including analytical databases and a sample tracking database that contained a comprehensive record of every sample collected. These databases were used to monitor the status of each sample from collection through elevation to IRDMIS Level III. Additional data management activities included the production of chemical data summary tables.

2.2.1 Sample Tracking and Chain-of-Custody

Arthur D. Little employed its menu-driven Sample Tracking System (STS) to maintain the tracking database, produce bar-coded sample labels and computerized chain-of-custody forms, and to monitor the status of samples throughout the duration of this program. Prior to the initiation of field activities, Arthur D. Little, working with the USAEC Project Officer, determined the specific type and number of samples to be collected in each system. This information was programmed into the STS. When a sample was to be collected, the STS prompted the field sampler for necessary data, including Site ID, type of sample, medium, method of collection, and required analyses. The software then generated an 8-character Field Sample Number for each sample and a bar coded sample label for each appropriate aliquot. In addition, the software automatically created a record for each sample in the sample tracking database that included appropriate IRDMIS codes such as Media Type, Site Type, Installation Code, and Method. These codes were based on the *IRDMIS User's Guide, Volume II, Data Dictionary*, and the STS was updated as revisions to the Data Dictionary were produced.

Upon sample collection and as the shipping coolers were being packed, the bar code on each label was scanned by the field sampler using a hand-held laser scanner. The STS added additional information including date and time of collection, and update

of the sample tracking database. The STS then issued a computer-generated chain-of-custody form that had all the required IRDMIS codes in the correct location.

On a weekly basis, DataChem electronically transmitted laboratory status reports to Arthur D. Little. Sample status in the sample tracking database was updated to indicate the sample status in the laboratory. When sample analysis was completed, Level II chemical data were transmitted to Arthur D. Little, and sample status was updated to indicate that data were at Level II. Upon reaching Level III, the sample tracking database was again updated to indicate that the appropriate sample had been completed.

2.2.2 Map Data

The most recent map files of Fort Devens were obtained from Potomac Research Institute (PRI) prior to the initiation of field sampling activities. When the location of new sampling sites was determined, the appropriate IRDMIS map information was added to the map file using the IRDMIS PC Data Entry and Validation Subsystem. Map information included, but was not limited to the Site Identification, Site Type, Media Type, and approximate X, Y, and Z location information as specified by the *IRDMIS Users Guide, Volume II, Data Dictionary*. The updated map file was then electronically transmitted to both PRI and Arthur D. Little's laboratory so that map data were available for group checking of chemical data and to ensure that all data were elevated to Level III as rapidly as possible. When site locations were determined with greater accuracy, the map file was updated and transmitted to PRI.

2.2.3 Chemical Data

Chemical data produced by DataChem were entered into IRDMIS using the PC Data Entry and Validation subsystem. Data recorded and group checked to ensure that appropriate and valid entries existed in all fields and transmitted to Arthur D. Little for review. Upon approval the data were transmitted to PRI for elevation to Level III. Data that reached Level III were electronically accessed by connecting to PRI's Pyramid minicomputer and executing three customized Ingres SQL statements that extracted the appropriate data from the CHEM, CHEM2, and CQC tables. These data were then downloaded as ASCII text and imported into Arthur D. Little's local program database. As the data were loaded into the local program database, each sample was automatically compared to the sample tracking database by the database software and the status upgraded to indicate that the appropriate data had reached Level II and were in Arthur D. Little's possession.

2.2.4 Summary Data Table Production

Summary data tables were prepared by extracting chemical data from the local program database, and grouping by AREE, media type, and method. The data were exported to Quattro Pro, and transferred into the summary data table format.

3.0 Storm Sewer System Description and Sample Collection

Section 3.0 discusses the 55 storm sewer systems evaluated on Fort Devens's Main and North Posts. Each system is described by discussing the storm sewer system location, the sample locations, results of route verification, and associated land use. Associated AOCs, SAs, and AREEs are also presented, where applicable, for each system. Table 3-0 provides a listing of storm sewer systems and associated AOCs, SAs, and AREEs. Those AOCs, SAs, and AREEs that either directly discharge to a storm sewer system or could affect a system from indirect or overland flow are listed as having an association.

3.1 System #1

System #1 drains an area located to the west of Building 3769 (the Armory), just south of Barnum Gate on Barnum Road. Beginning at Barnum Road, the system drains to the southeast and empties from a headwall into a drainage swale, which discharges to Cold Spring Brook.

The Supplemental Work Plan proposed three storm system samples to be collected from this system: one water sample from the outfall and two sediment samples from manholes along the drainage route. Field conditions required adjustment to the sampling locations because no water was discharging from the outfall pipe. One water and one sediment sample was collected from a manhole within the system and one sediment sample was collected from the outfall at system #1, as shown in Figure 3-1. The water sample was collected from standing water within the manhole. The discharge route for system #1 was verified prior to initiation of the sampling program by introducing water and tracing its flow through the system.

Results of chemical analyses of the water and sediment samples collected from system #1 are presented in Table 3-1.

Land use of the site, as determined from 1943 aerial photographs, was a large railyard. From 1952 to the present, the area has been used for vehicle storage. The entire area is currently occupied by the Massachusetts Army National Guard. There are no AOCs, AREEs, or SAs associated with this system.

3.2 System #2

System #2 is a small system that drains the east side of Barnum Road, opposite Building 258. The system drains to the northeast and empties from the headwall into a drainage swale, which is the same drainage swale that system #1 drains to. The

drainage swale then drains into Cold Spring Brook. Route verification showed that the western portion of system #2 (as shown in the Work Plan) flows into the northeastern section of system #3. In addition, the lower portion of system #4 flows into system #3. As a result, System #2 not only has an outfall, but is also connected to system #3.

The Supplemental Work Plan proposed three storm system samples to be collected from this system: one water sample from the outfall and two sediment samples from manholes along the drainage route. Field conditions required adjustment to the sample point locations because the discharge point into the drainage swale was the same as system #1. In addition, the west side of the system is connected to system #3. Therefore, one sediment sample and one water sample from standing water were collected from within system #2 (2A), as shown in Figure 3-1. The two samples collected at sample point 2A should be evaluated with the data from samples collected within system #3. The discharge route for system #2 was verified by introducing water into the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #2 are presented in Table 3-2.

Historical land use associated with system #2 has always been a roadway (Barnum Road). There are no AREEs or SAs associated with this system.

3.3 System #3

System #3 is a large system that drains an area around Building 259, which is occupied by the National Guard vehicle maintenance shop. Runoff is collected from around Building 259 and land to the west of Barnum Road where large lots are used for vehicle storage. The runoff flows southeast under Barnum Road and is discharged through a headwall into a drainage swale that leads to Cold Spring Brook. During route verification it was discovered that this system accepts flow from system #4. For evaluation purposes, systems #2, #3, and #4 are considered to be connected.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system: one sediment sample from within the system and one each of sediment and water from the outfall. Additional water samples were allocated to system #3 because of the reduced number of water samples collected during the AREE 70 evaluation. One sample was collected at the outfall and one internal to the system. A total of two water samples from standing water and two sediment samples were collected from system #3 at two locations (3A and 3B), as shown in Figure 3-1. The discharge route for system #3 was verified by introducing water and dye into the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #3 are presented in Table 3-3.

Aerial photographs indicate that the site has been occupied by motor pools, vehicle repair shops, and vehicle storage yards from 1943 to present. The area is presently used for vehicle repair and storage. AREEs 61B and 61AU, AOCs 44 and 52, and SA 38 are associated with this system.

3.4 System #4

System #4 drains a large area located to the southwest of Building 259. System #4 flows to the southwest, where it meets runoff collected from the northern and eastern sides of Building 3713. The system passes under Barnum Road to the southeast, where it collects runoff from Buildings 3757 and 3758, and flows northeast into system #3. For evaluation purposes, systems #2, #3, and #4 are considered to be connected.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system: one sediment sample from within the system and one each of sediment and water from the outfall. Because system #4 flows into system #3, a total of one water sample from standing water and one sediment sample were collected from a manhole within system #4 (4A), as shown in Figure 3-1. The discharge route for system #4 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #4 are presented in Table 3-4.

Available historical land use information for this area dates back to 1942, when Building 3713 was constructed. Aerial photographs indicate that the site has been used for vehicle maintenance and storage since that time. AOC 44, AOC 52, and AREEs 61X and 69AU are associated with system #4.

3.5 System #5

System #5 is a small system that drains the western portion of the land occupied by the Massachusetts Army National Guard to the west of Barnum Road, near Buildings 3702 and 3703. The system collects surface runoff from the paved areas around Buildings 3702 and 3703, flows northwest under the road leading to Grove Pond, and discharges into a wooded area on the southeast side of Grove Pond.

In accordance with the Supplemental Work Plan, one sediment sample was collected from the outfall of system #5 (5A), as shown in Figure 3-1. The discharge route for system #5 was verified by introducing water into the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment sample collected from system #5 are presented in Table 3-5.

Aerial photographs from 1943 indicate that the site was occupied by motor pools, vehicle repair shops, and vehicle storage yards. The area is presently used for vehicle repair and general storage by the Massachusetts Army National Guard. AOCs 44 and 52 are associated with this sytem.

3.6 System #6

System #6 collects runoff from around Buildings 3712 and 3713, an area that includes vehicle storage areas and a portion of unpaved railroad track. Flow is initially southwest before turning southeast, passing under Barnum Road, and discharging into a drainage swale that leads to Cold Spring Brook.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system: one sediment sample from within the system and one each of sediment and water from the outfall. The sampling plan was modified to capture flow from each part of system #6: three sediment and two water samples were collected at three locations (6A, 6B, and 6C), as shown in Figure 3-1. Water sample at location 6A was collected from standing water and location 6B from flowing water. The discharge route for system #6 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #6 are presented in Table 3-6.

Historical land use near system #6, as determined from aerial photographs, includes a commissary and vehicle storage/maintenance facility. It was determined that system #6 received approximately 3,000 gallons of No. 4 fuel spilled from an overfilled underground storage tank. This fuel spill was investigated as SA 57 during the Groups 2, 7 investigation. The old commissary (Building 3712) is currently leased to the Boston Maine Railroad. The AREEs and SAs associated with this system are 61X, 61AA, 69AN, 69AT, 69AS, SA 57, and SA 38.

3.7 System #7

System #7 is a small system that drains a wooded area located south of system #6, near Barnum Road and Cold Spring Brook. The system flows to the east, under Barnum Road, and then into a drainage swale that leads to Cold Spring Brook.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system: one sediment sample from within the system and one each of sediment and water from the outfall. Field conditions required adjustment to the sampling plan. One sediment and one standing surface water sample were collected within the system (location 7A, Figure 3-1). One sediment sample was collected at the outfall (location 7B, Figure 3-1). The discharge route for system #7 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #7 are presented in Table 3-7.

Historical land use near system #7 includes a driver training facility to the northwest and railroad tracks to the west. Cold Spring Brook lies beyond Barnum Road to the east of system #7. There are no AOCs, SAs, or AREEs associated with this system.

3.8 System #8

System #8 drains a wooded area that lies at the intersection of Barnum Road and Dakota Street. The system flows from the northwest to the southeast, crossing under Barnum Road and continuing through a marshy area that discharges into Cold Spring Brook.

The Supplemental Work Plan proposed one water and one sediment sample to be collected from this system (from the culvert under Barnum Road). Field conditions required adjustment to the sampling plan because no water was in the culvert at the time the samples were collected. A total of one sediment sample was collected from system #8 (8A) from the system outfall (culvert), as shown in Figure 3-1. The discharge route for system #8 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analysis of the sediment sample collected from system #8 are presented in Table 3-8.

Historically, the land crossed by system #8 has been wooded to the east, and contains railroad tracks and woodlands to the west. There are no AOCs, SAs, or AREEs associated with this system.

3.9 System #9

System #9 is an extensive system that drains paved residential areas, unpaved railroad tracks, and unpaved storage yards located near the intersection of Bates Service Road and Cavite Street. The system runs east along Cavite street, then drains south along Saratoga Street and discharges into Cold Spring Brook at the junction of Saratoga Street and Barnum Road.

As originally planned in the Supplemental Work Plan, two water and six sediment samples were collected from this system: both sediment and water samples at the outfall and the first manhole in the system, and then one sediment sample from each of the other four sample points within the system. The water sample collected at location 9A was in flowing water and at location 9B in standing water. The six locations (9A, 9B, 9C, 9D, 9E, and 9F) are shown in Figure 3-1. The discharge route for system #9 was verified by introducing water and dye into the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #9 are presented in Table 3-9.

Historical land use near system #9 includes a railyard to the north and east, which has been in place since at least 1942. A historical blacksmith shop, lumber yard, and dispatch office located in the center of system #9 are currently occupied by the electric shop, hazardous waste storage area, and heating shop. The northwestern portion of system #9 is occupied by housing units, which were originally constructed in the 1950s. The AREEs associated with system #9 include 61D(AP), 61AV, 61AX, 61AY, 69F, and 63S. SA 29 is located west of sample point 9B and south of point 9F.

3.10 System #10

System #10 is a small system that drains the paved vehicle storage area associated with Building 1401. The system flows north from Building 1401 and discharges into a grassy area. Railroad tracks run parallel to this system to the east.

As originally planned in the Supplemental Work Plan, one water and two sediment samples were collected from this system: both sediment and water samples at the outfall and sediment only at a manhole within the system. These samples were collected from system #10 at two locations (10A and 10B), as shown in Figure 3-1. The water sample was collected from standing water. The discharge route for system #10 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #10 are presented in Table 3-10.

Land use near system #10 includes a railyard to the east, which has been in place since at least 1942. Historical land use includes two railroad warehouses, which were demolished in the 1960s, when Buildings 1401, 1402, 1403, and 1404 were constructed. Building 1401 is currently a maintenance building that has nine bays, a hazardous waste satellite accumulation area, offices, bathrooms, and a boiler room. AREEs 61E and 69O are associated with system #10.

3.11 System #11

The majority of system #11 has been destroyed, leaving a drainage ditch running north/south along the west side of an old coal storage yard. Flow from system #11 is to the north, but turns sharply to the west, where it runs past the northern edge of the elementary school.

As originally planned in the Supplemental Work Plan, two sediment samples were collected from this system: one from a collapsed headwall at the outfall point, and one from the dry drainage swale. In fact, both sediment samples were collected from the dry swale at locations 11A and 11B, as shown in Figure 3-2. The discharge route for system #11 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #11 are presented in Table 3-11.

Historical land use near system #11 includes an elementary school and the contractor's yard at the DRMO (Defense Reutilization and Materials Organization), which had been used for coal storage. Evidence of coal ash is still present at the contractor's yard. AREE 61BD is associated with system #11.

3.12 System #12

System #12 drains a large area that surrounds land at the intersection of Cook and Antietam Streets. It drains the area around the old Cold Storage building, Building 226, the present-day Directorate of Public Works (DPW) Building 219, and the Roads and Grounds vehicle maintenance shops. The system generally flows to the west along Antietam Street and enters Willow Brook to the west of the elementary school.

As originally planned in the Supplemental Work Plan, four sediment samples were collected from this system: one from an outfall located near the elementary school, and the other three from drainage points along the system. The four sediment samples were collected from system #12 at four locations (12A, 12B, 12C, and 12D), as shown in Figure 3-2. No surface water samples were collected because the system was dry at the time of sampling. The discharge route for system #12 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #12 are presented in Table 3-12.

Land use near system #12 includes a DPW maintenance facility, originally constructed in 1943. This facility was used in conjunction with the railroad and tracks that ran along the western side of the structure. Building 242 was a fire station in the 1940s and was later converted into a gas station and maintenance building. Current land use is as a DPW Roads and Railways maintenance facility. The AREEs and SAs associated with system #12 are 61AB, 61AD, 61A, 63A, 63B, SA 33, SA 34, and SA 35.

3.13 System #13

During the process of route verification, it was learned that system #13 was joined to system #12. Because of this, system #13 was eliminated from this study.

3.14 System #14

System #14 drains an area occupied by barracks and an unpaved vehicle storage area located in the vicinity of the junction of Market and Carey Streets. Drainage flows from south to north, and there are two outfalls from the system that discharge into the area of Shepley Hill Landfill.

As originally planned in the Supplemental Work Plan, four sediment and two water samples were collected from this system: one sediment and one water sample from one outfall (14A), one sediment from a second outfall that discharges to the Shepley Landfill (14C), and two surface water and sediment samples from a manhole within the system (14B). The water sample from location 14A was collected from flowing water and at 14B from standing water. These sample locations are indicated on Figure 3-2. The discharge route for system #14 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #14 are presented in Table 3-14.

Land use near system #14 includes an historical motor pool that was originally constructed in 1942, located at the corner of Carey and St. Mihiel Streets. The land crossed by this system also contains a Regional Training Site/Medical Building (RTS/MED-Building 1677). The AREEs and SAs associated with system #14 are 61Z, 61AC, 61AE, 61BE, 61D (61AP), 69AD, 69AI, and SA-48.

3.15 System #15

System #15 is an open drainage ditch that runs along the west side of Antietam Street to the south of Cold Harbor Road. The system runs under Antietam Road in a culvert, then to the east into a wooded area as an open ditch. It does not join any other storm sewer system.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system: one sediment sample from within the system and one each of sediment and water from an outfall. There was no water present in the system when it was sampled, so only one sediment sample was collected from a dry drainage swale within system #15. Since the system is small and one sample would suffice, the sediment sample was collected from system #15 (15A), as shown in Figure 3-2. The discharge route for system #15 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment sample collected from system #15 are presented in Table 3-15.

Land use near system #15 includes a reservoir fuel oil storage area that contains six 10,000-gallon No. 2 fuel oil tanks just to the northeast. The tanks were constructed in 1980 and are empty at present. The one AREE associated with system #15 is 61AY, the tank storage area.

3.16 System #16

System #16 drains the southern half of the Davao Circle housing area. The system drains to the southeast along Bulge Road, passes under Patton Road and then enters Cold Spring Brook.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system: one sediment sample from within the system and one each of sediment and water from the outfall. Field conditions required adjustment to the sampling plan because there was no water at the outfall, so one sediment sample was collected from an internal manhole and at the outfall. The two sediment samples were collected from system #16 at two locations (16A and 16B), as shown in Figure 3-2. The discharge route for system #16 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #16 are presented in Table 3-16.

Land use near system #16, according to a series of aerial photographs dating back to 1943, includes the Davao Circle Housing Area, which was constructed by 1965. Prior to that it was woodland. There are no AOCs, SAs, or AREEs associated with system #16.

3.17 System #17

System #17 drains an area near the intersection of Patton Road and Marne Street. This system is poorly defined and appears to only channel road runoff into a wooded area that eventually reaches Cold Spring Brook.

The Supplemental Work Plan proposed two water and two sediment samples to be collected from this system: all from two depressions next to the road. Field conditions required adjustment to the sampling plan because there was no water at either of the sampling points, so sediment only was collected at each location (17A and 17B), as shown in Figure 3-3. The discharge route for system #17 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #17 are presented in Table 3-17.

The land drained by system #17 has always been woodlands, according to a series of aerial photographs dating back to 1943. There are no AREEs or SAs located directly within the route of system #17, but is one SA and one AOC are located next to it: SA 16 to the east and AOC 40 to the west.

3.18 System #18

System #18 collects runoff from the Salerno Circle Housing area. Flow is from the north to the south, down a steep slope and under Sheridan Road. The system then discharges into the Oxbow National Wildlife Refuge via an outfall.

The Supplemental Work Plan proposed one water and three sediment samples to be collected from this system: two sediment samples from within the system and one sediment and water sample from the outfall. No water was present at the outfall, so one sediment sample was collected from each of the three proposed sampling locations (18A, 18B, and 18C), as shown in Figure 3-3. The discharge route for system #18 was verified by introducing water into the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #18 are presented in Table 3-18.

Land use near system #18 includes the Salerno Circle Housing Area, which was originally constructed in 1962. Sheboken Well is located to the west of system #18. There are no AOCs, SAs, or AREEs associated with system #18.

3.19 System #19

System #19 drains an area located near the intersection of Buena Vista and Dakota Streets. This system drains to the west, where it enters the head of Willow Brook at the point where it leaves Robbins Pond.

As originally planned in the Supplemental Work Plan, two sediment samples were collected from this system: one from the outfall and one from a catchment basin within the system (19A and 19B), as shown in Figure 3-2. The discharge route for system #19 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #19 are presented in Table 3-19.

Land use near system #19 includes a mess hall constructed in the early 1900s, which became a photographic laboratory in the 1970s (Building 1453). Building 1450 was also constructed as part of the mess hall in the early 1900s, and is currently used as a veterinary clinic. The AREEs and SAs associated with system #19 are 61BF, 61AO, 61AH, and SA 2.

3.20 Systems #20A and #20B

During the document review and inspection of system #20, it was learned that it has two separate sections. Therefore, the system has been divided into #20A and #20B. System #20A drains the north side of Queenstown Street, beginning at the intersection of 10th Mountain Division Road and Queenstown Street. The system then drains to the northeast, under Dakota Street and into Willow Brook. System #20B collects runoff from the paved parking lot of the PX and drains to the southeast, under Queenstown Street. It then discharges through a headwall into a drainage swale. Its flow continues to the east, under Patch Road, where it enters a stream that flows into Robbins Pond.

The Supplemental Work Plan proposed one water and three sediment samples to be collected from this system. Because the system was divided in two, and because there was no water in the system to collect a water sample, an adjustment was made to the sampling plan. One sediment sample was collected from the outfall of system #20A (20A) and two sediment samples, one from an outfall and one at an internal manhole, were collected from system #20B (20B and 20C), as shown in Figure 3-2. The discharge routes for systems #20A and #20B were verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #20A and #20B are presented in Tables 3-20A.

Land use near system #20A includes a former gasoline station originally constructed in the 1940s. This site is AREE 61AQ. There are no AOCs or SAs associated with system #20A. Land use in the vicinity of system #20B includes fields that were developed in 1988 to house a car wash (Building 2017); a shopping center that was originally a gas station and motor vehicle repair facility, first constructed in the 1940s and converted in the 1970s (Building 2021); an Army medical equipment storage area that was originally a gasoline station in the 1940s; and another parcel that was open fields until it was developed into an autocraft shop in the 1970s (Building 3587). The AREEs and SAs associated with system #20B include 61C, 61AZ, 61AQ, 61AI, 61AR, 61F, SA 43F, SA 43B, SA 43C, and SA 43D.

3.21 System #21

System #21 collects runoff from the south side of the Parade Ground and drains to the east, under MacArthur Avenue. It then enters Willow Brook to the south of Cavite Street. System #21 discharges to Willow Brook in a manhole where Willow Brook is channelled through a conduit. There is no outfall at the headwall. This system is composed of three subsystems. Samples were collected within the vicinity of the system's outfall as part of the AREE 70 River Evaluation. Refer to Addendum 1 for information regarding sampling in Wilow Brook.

The Supplemental Work Plan proposed one water and three sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system, so one sediment sample was collected from each of four locations. The four sediment samples were collected from system #21 at four manholes within the system (21A, 21B, 21C, and 21D), as shown in Figure 3-2. The discharge route for system #21 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #21 are presented in Table 3-21.

Land use near system #21, according to a series of aerial photographs dating back to 1943 was grasslands used for parades. There are two AREEs located near system #21: 61AW and 69R. There are no AOCs or SAs associated with system #21.

3.22 System #22

System #22 collects runoff from the area around the intersection of Smith and Buena Vista Streets. This system drains to the northeast and discharges into Willow Brook where Antietam Road and MacArthur Avenue meet.

As originally planned in the Supplemental Work Plan, one water and two sediment samples were collected from this system: one water sample from standing water and one sediment sample from the manhole located at the bottom of the hill adjacent to the outfall point, and another sediment sample from the manhole located at the top of the hill, near the Military Police station (22A and 22B), as shown in Figure 3-2. The discharge route for system #22 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #22 are presented in Table 3-22.

Land use near system #22 includes an Intelligence School General Instruction Building and Post Headquarters Building (Buildings P-12 and P-3). However, system #22 primarily drains roadways that run between these and other buildings. AREE 61AK is the only AREE associated with system #22. There are no AOCs or SAs associated with system #22.

3.23 System #23

System #23 collects runoff that begins on the east side of the Grant Housing Area and includes runoff from around Building 22. Flow is initially towards the east but turns north at the corner of Antietam Street and Sherman Avenue. This system discharges into Willow Brook, near the Verbeck Housing Area.

The Supplemental Work Plan proposed one water and three sediment samples be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system; therefore, one sediment sample was collected from each of three locations. The three sediment samples were collected from three manholes within the system (23A, 23B, and 23C), as shown in Figure 3-2. The sample taken at the outfall (SSA 93-93A) was taken as part of the Willow Brook. The discharge route for system #23 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #23 are presented in Table 3-23.

Historical land use near system #23 includes an Intelligence School General Instruction Building and Post Headquarters Building (Buildings P-12 and P-3). System #23 also crosses grassed land and a housing area to the west. There are two AREEs located near system #23: 61AL and 61AK. There are no AOCs or SAs associated with system #23.

3.24 System #24

System #24 drains an area of the golf course located south of Patton Road, between Jackson and Sheridan Roads. This system discharges into a pond north of Jackson Gate, which in turn drains under Jackson Road to a drainage swale that discharges into the Nashua River.

As originally planned in the Supplemental Work Plan, one water and three sediment samples were collected from this system: one water sample from standing water and one sediment sample from the outfall, and two sediment samples from two drainage

ditches within the system (24A, 24B, and 24C), as shown in Figure 3-3. The discharge route for system #24 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #24 are presented in Table 3-24.

Land use near system #24 includes the golf course. Near the golf course, on Patton Road near Jackson Gate, there is a building that was originally constructed in the early 1940s as a fire station. It became a Rod and Gun Club in 1969 and was renovated in 1984 to house the Test Measurement and Diagnostic Equipment (TMDE) Division, Building 3605 (AREE 61N). This is the only AREE associated with system #24. There are no AOCs or SAs associated with system #24.

3.25 System #25

System #25 drains a wooded area located to the south of the Trailer Park, where Hoff and Lovell Streets intersect. The system flows toward the east, and discharges into the Nashua River via a drainage swale.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system: one water and sediment sample from the outfall, and one sediment sample from a manhole within the system. Field conditions required adjustment to the proposed sampling locations because there was no water in the system. Therefore, two sediment samples were collected from system #25 at two locations, one internal and one at the outfall (25A and 25B), as shown in Figure 3-2. The discharge route for system #25 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #25 are presented in Table 3-25.

Historical land use near system #25 included use as a hospital, according to aerial photographs. Since the late 1970s, when the hospital was demolished, the area has been partially occupied by trailers. SA 55 is associated with system #25 and is located north of the system. It does not discharge directly to system #25.

3.26 System #26

System #26 collects runoff from a small area of Lake George Street located north of Building 2613. The system flows to the west and discharges into the Nashua River.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system: one water and sediment sample from the outfall, and one sediment sample from within the system. Field conditions required adjustment to the proposed sampling locations because there was no water in the system. Two sediment samples were collected from system #26 at two locations: one internal and one outfall sample (26A and 26B), as shown in Figure 3-3. The discharge route for system #26 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #26 are presented in Table 3-26.

Historical land use near system #26 included barracks to the east and woodlands to the west, according to a series of aerial photographs dating back to 1943. The barracks have been demolished and the land partially occupied by system #26 is now paved parking and grassed areas adjacent to Building 2602. No AREEs or SAs appear to discharge directly to system #26. However, the following AREEs and SAs are near system #26: 63Y to the northeast; 61Q, 69B, and 63AJ to the south; 63AI and 63AG to the south/southeast; SA 58 to the east; and SA 43M to the southwest.

3.27 System #27

System #27 drains an area around Building 3412, the O'Neill Building. System flow is to the east, under Lovell Street, where it discharges to the Nashua River via a drainage swale.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system: one water and sediment sample from a culvert at the outfall, and one sediment sample from a manhole located near Building 3412. Field conditions required adjustment to the proposed sampling locations because there was no water in the system. Two sediment samples were collected from system #27 at two locations, one internal and one at the outfall (27A and 27B), as shown in Figure 3-3. The discharge route for system #27 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #27 are presented in Table 3-27.

Historical land use near system #27 included a World War II Hospital called Hospital South, presumably constructed in the 1940s. In the 1970s the hospital building was demolished and the land remained vacant until the O'Neill Building was constructed in 1984. Current uses of the O'Neill Building include classrooms, offices, and

maintenance bays. The AREEs and SAs located within system #27 include SA 43S and AREE 61BB. Just south of the system is AREE 61BC. North of the system are AREEs 61V and 69F and SA 51.

3.28 System #28

System #28 primarily drains residential areas that include the Enlisted Barracks located east of Sherman Avenue where it intersects Grant Road. This system drains to the northwest, where it collects runoff from three residential areas: Locust, Spruce/Maple, and Oak Hill. The system runs parallel to and then under Hospital Road, where it discharges into the Nashua River.

The Supplemental Work Plan proposed one water and five sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system, so one sediment sample was collected from each of four locations: one at the outfall, two from drainage swale locations within the system, and one from a manhole within the system (28A, 28B, 28C, and 28D), as shown in Figure 3-2. The discharge route for system #28 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #28 are presented in Table 3-28.

Historical land use near system #28 was woodland until the housing developments were constructed in the early 1960s. There are no AOCs, SAs, or AREEs located within system #28, but there are AREEs and SAs that could impact the system from overland flow: 61T, 61S, 61AN, SA 43P, SA 36, and SA 43O (SA-54).

3.29 System #29

System #29 collects runoff from the central portion of the Shirley Housing Area. The system then flows to the east, where it discharges into the Nashua River via a drainage swale.

The Supplemental Work Plan proposed one water and three sediment samples to be collected from this system: one water and sediment sample from the outfall, and two sediment samples from manholes within the system. Field conditions required adjustment to the sampling plan because there was no water in the system, so one sediment sample was collected from each of three locations. The three sediment samples were collected from system #29 at the two manholes within the system and the outfall (29A, 29B, and 29C), as shown in Figure 3-2. The discharge route for

system #29 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #29 are presented in Table 3-29.

Land use near system #29 includes vacant land and the Shirley Housing Area. This housing was first developed in 1962. SA 10 is associated with system #29. There are no AOCs or AREEs associated with system #29.

3.30 System #30

System #30 collects runoff from the Spruce/Maple Housing Area. Once it exits the housing area, it flows west and discharges into the Nashua River.

As originally planned in the Supplemental Work Plan, one water and two sediment samples were collected from this system: one water sample from standing water and one sediment sample from the outfall, and one sediment sample from a manhole located in the housing area (30A and 30B), as shown in Figure 3-2. The discharge route for system #30 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #30 are presented in Table 3-30.

Land use near system #30 includes land occupied by housing. On the southeastern edge of system #30, there is a building that was originally constructed sometime between 1952 and 1965. The building was once a community center, but is presently used by the Army Reserves for office supply and SCUBA equipment storage. There are no AOCs, SAs, or AREEs located within system #30.

3.31 System #31

System #31 drains the Birch Circle Housing Area. System flow is to the west, where it discharges into the Nashua River.

The Supplemental Work Plan proposed one water and three sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system, so one sediment sample was collected from each of three locations. The three sediment samples were collected from system #31 at the outfall and in each of two manholes within the system (31A, 31B,

and 31C), as shown in Figure 3-2. The discharge route for system #31 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #31 are presented in Table 3-31.

Land use near system #31 included open space and then housing, which was first developed in 1962. There are no AOCs, SAs, or AREEs located within system #31.

3.32 System #32

System #32 is a small system that drains an area behind the Cutler Army Hospital. This system then discharges into a drainage swale in the wooded area located east of the Hospital.

As originally planned in the Supplemental Work Plan, one water sample from flowing water and one sediment sample were collected from this system, both from the system outfall (32A), as shown in Figure 3-3. The discharge route for system #32 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #32 are presented in Table 3-32.

Historical and current land use near system #32 are the Cutler Army Hospital and related roadways and buildings (Building 3654), which were originally constructed in 1971. AREE 61AM and SA 1 are located within system #32.

3.33 System #33

System #33 is a large system that originates in an area located east of Building 2517. The system then flows to the south, where it flows under Patton Road and crosses a portion of the golf course before turning east and passing under Queenstown Street. System #33 also collects runoff from an area west of the Cutler Army Hospital and discharges into Mirror Lake via a drainage swale.

The Supplemental Work Plan proposed two water and four sediment samples to be collected from this system: two water samples and one sediment sample from drainage swales, and three additional sediment samples from other points within the system. Field conditions required adjustment to the sampling plan because there was no water in one of the drainage swales proposed for sediment and water sampling.

Therefore, only one sediment/water sample was collected from one drainage swale location from standing water and a second sediment sample was collected from another drainage swale location. Three additional sediment samples were collected from other points within the system.

A total of one water and four sediment samples were collected from system #33 at four locations (33A, 33B, 33C, and 33D), as shown in Figure 3-3. The water sample was collected on location 33C. The discharge route for system #33 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #33 are presented in Table 3-33.

Land use near system #33 includes an historical gasoline station and motor pool originally constructed in the 1940s (AREE 61W), and a transportation motor pool to the west and northwest (AREE 61O). The center and eastern parts of the system cross the golf course. Additional AREEs and SAs associated with system #33 are 63AX, 61O, 61AM, SA 43K and SA 49.

3.34 System #34

System #34 drains an area near the intersection of Patton Road and Queenstown Street. The system flows east along Patton Road, and then south, where it forms a drainage swale and discharges into Mirror Lake.

The Supplemental Work Plan proposed two water and three sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Therefore, one sediment sample was collected from each of three locations: one where the stream enters Mirror Lake, and two at the open ditch along Patton Road (34A, 34B, and 34C), as shown in Figure 3-3. The discharge route for system #34 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #34 are presented in Table 3-34.

Land use near system #34 includes the golf course and Patton Road. There are no AOCs, SAs, or AREEs located within system #34.

3.35 System #35

System #35 collects runoff from a paved motor pool at the intersection of Queenstown Street and Patton Road. The system originates under Queenstown Street, and then proceeds eastward, where it discharges via two drainage swales into a wooded area. A separate portion of system #35 drains an unnamed road that joins Queenstown and Quebec Streets, but discharges through the drainage swales.

The Supplemental Work Plan proposed two water and four sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system, so one sediment sample was collected from three locations. Only three points were sampled in this system because, upon field inspection, three sample points could adequately characterize system #35. Sediment samples were collected from system #35 from two separate locations within the drainage swales, and at one manhole within the system (35A, 35B, and 35C), as shown in Figure 3-3. The discharge route for system #35 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #35 are presented in Table 3-35.

Land use near system #35 includes the 2nd and 3rd Battalion of the 10th Special Forces Motor Pool Repair Facility, constructed during the 1960s (AREE 61J). AREE 61J is associated with this system.

3.36 System #36

System #36 was sampled as part of the Supplemental Site Investigation for SA 43H and SA 43, and has not been addressed in this study.

3.37 System #37

System #37 drains a large area of both paved roads and unpaved sports fields and parade grounds. Originating at the present-day soccer field on Sherman Avenue, the system drains to the southeast, splits into two sections, passes under Queenstown Street, and discharges from two outfalls into a wooded area east of Queenstown Street.

The Supplemental Work Plan proposed two water and five sediment samples to be collected from this system. A lack of sediment at the proposed sample points in the system required adjustment to the sample locations. Two water samples from flowing water and four sediment samples were collected from two outfalls, one manhole and

one culvert within the system (37A, 37B, 37C, and 37D), as shown in Figure 3-3. Water samples were collected at the outfalls (37A, 37B). The discharge route for system #37 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the water and sediment samples collected from system #37 are presented in Table 3-37.

The primary historical land use near system #37 has included barracks used since the 1940s. Current land use includes offices, barracks, playing fields, grassed and wooded areas. The AREEs and SAs associated with system #37 are 61I, 61U, 61AT, 69AV, SA 43H, and SA 43I.

3.38 System #38

System #38 drains an area of barracks located between Quebec and Queenstown Streets. The system flows southeast, where it passes under Queenstown Street and discharges to a wooded area located east of Queenstown Street.

The Supplemental Work Plan proposed two water and four sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system, therefore, one sediment sample was collected from each of four locations: two from the outfalls and two from manholes within the system (38A, 38B, 38C, and 38D), as shown in Figure 3-2. The discharge route for system #38 was verified by introducing water and dye to the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #38 are presented in Table 3-38.

Historical land use near system #38 includes use as barracks since the 1940s. Current land use includes offices, barracks, playing fields, and grassed and wooded areas. The AREEs and SAs associated with system #38 are SA 43H and AREEs 61H and 61I.

3.39 System #39

System #39 drains a large paved area between Quebec and Queenstown Streets. The system flows southeast, where it passes under Queenstown Street and discharges into a wooded area located east of Queenstown Street.

The Supplemental Work Plan proposed two water and three sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system and little sediment. One sediment sample was collected from each of two locations (rather than three locations): one from a drainage swale and one from a manhole within the system (39A and 39B), as shown in Figure 3-2. The discharge route for system #39 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses of the sediment samples collected from system #39 are presented in Table 3-39.

The primary historical land use near system #39 includes barracks used since the 1940s. Current land use includes offices, barracks, playing fields, and grassed and wooded areas. The AREEs and SAs associated with system #39 are 61C, 61AS, 61H, and SA 43F.

3.40 System #40

System #40 is a small system located on the western side of Queenstown Street. It drains the paved area around Building 2007, which houses the bowling alley. The system flows to the southeast, where it crosses under Queenstown Street near the stables and discharges from a collapsed headwall in a field to the west of Patch Road.

The Supplemental Work Plan proposed one water and one sediment sample to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Only one sediment sample was collected at a collapsed headwall at the system outfall (40A), as shown in Figure 3-2. The discharge route for system #40 was verified by introducing water into the system prior to initiation of the sampling program.

Results of chemical analyses performed on the sediment sample collected from system #40 are presented in Table 3-40.

Land use near system #40 includes use as stables and fields dating back to the 1940s. Current land use includes a gasoline station, car wash, autocraft shop, vehicle maintenance shop, and stables. The AOCs, SAs, and AREEs associated with system #40 include 61G, 61AB, 61AZ, 69AP, 61AI, and AOC 43G.

3.41 System #41

System #41 drains the area around the hangars on the northern side of the Moore Army Air Field (MAAF). The system flows from south to north, with two discharge points located outside the perimeter fence that runs along Route 2A.

The Supplemental Work Plan proposed one water and three sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Therefore, four sediment samples were collected at four locations: two from ditches and two from manholes within the system (41A, 41B, 41C, and 41D), as shown in Figure 3-4. The discharge route for system #41 was verified by visually tracing the system prior to initiation of the sampling program.

Results of chemical analyses performed on the sediment samples collected from system #40 are presented in Table 3-41.

A series of aerial photographs dating back to 1943 indicates that historical land use has always been an airfield. AREE 61Y is associated with system #41.

3.42 System #42

System #42 drains the western section of the heliport area at the MAAF. The system flows to the east and discharges within the perimeter fence located next to Route 2A.

The Supplemental Work Plan proposed one water and one sediment sample to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Therefore, one sediment sample was collected from the outfall located near the parachute shop (42A) as shown in Figure 3-4. The discharge route for system #42 was verified by visually tracing the system prior to initiation of the sampling program.

The results of the chemical analyses performed on the sediment sample collected from system #42 are presented in Table 3-42.

A series of aerial photographs dating back to 1943 indicates that historical land use has always been an airfield. Current use remains as an airfield. SA 50 is associated with system #42. There are no AOCs or AREEs associated with system #42.

3.43 System #43

System #43 is composed of three separate systems that drain the eastern half of the heliport. It also drains the northern section of the north/south runway and the eastern half of the east/west runway. The Supplemental Work Plan proposed two water and five sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Therefore, three sediment samples were collected at three separate locations, which are all outfalls from the system (43A, 43B, and 43C), as shown in Figure 3-4. The two remaining sediment samples were not collected because there was no sediment in the system. The discharge route for system #43 was verified by visually tracing the system prior to initiation of sampling.

The results of the chemical analyses performed on the sediment samples collected from this system are presented in Table 3-43.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are two SAs and one AREE associated with system #43: 61Y, SA 47, and SA 50.

3.44 System #44

System #44 drains the northwestern side of the southwestern/southeastern runway, south of where the north/south runway crosses it. The system discharges to an area located beyond the eastern perimeter fence of the MAAF.

As originally proposed in the Supplemental Work Plan, one sediment sample was collected from the system outfall (44A), as shown in Figure 3-4. The discharge route for system #44 was verified by visually tracing the system prior to initiation of sampling.

The results of the chemical analyses performed on the sediment sample collected from system #44 are presented in Table 3-44.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #44.

3.45 System #45

System #45 drains the southeastern side of the southwestern/southeastern runway, south of where the north/south runway crosses it. The system discharges to an area located beyond the eastern perimeter fence of the MAAF.

As originally proposed in the Supplemental Work Plan, one sediment sample was collected from the system outfall (45A), as shown in Figure 3-4. The discharge route for system #45 was verified by visually tracing the system prior to initiation of sampling.

The results of the chemical analyses performed on the sediment sample collected from system #45 are presented in Table 3-45.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #45.

3.46 System #46

System #46 drains the northwest corner of the southeast section of the southeast/northwest runway at the MAAF. This system discharges into a wooded area located beyond the eastern perimeter fence.

As originally proposed in the Supplemental Work Plan, one sediment sample was collected from the system outfall (46A), as shown in Figure 3-4. The discharge route for system #46 was verified by visually tracing the system prior to initiation of sampling.

The results of the chemical analyses performed on the sediment sample collected from system #46 are presented in Table 3-46.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #46.

3.47 System #47

System #47 drains the southeastern corner of the southeastern section of the southeast/northwest runway at the MAAF. This system discharges into a wooded area located beyond the eastern perimeter fence.

As originally proposed in the Supplemental Work Plan, one sediment sample was collected from the system outfall (47A), as shown in Figure 3-4. The discharge route for system #47 was verified by visually tracing the system prior to initiation of sampling.

The results of the chemical analyses performed on the sediment sample collected from system #47 are presented in Table 3-47.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #47.

3.48 System #48

System #48 drains the southeastern end of the southeast/northwest runway of the MAAF. The system discharges into a wooded area located beyond the southern perimeter fence.

As originally proposed in the Supplemental Work Plan, one sediment sample was collected from the system outfall (48A), as shown in Figure 3-4. The discharge route for system #48 was verified by visually tracing the system prior to initiation of sampling.

The results of the chemical analyses performed on the sediment sample collected from system #48 are presented in Table 3-48.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #48.

3.49 System #49

System #49 drains the southern end of the north/south runway. The system has two discharges to a wooded area outside of the western perimeter fence of the MAAF.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Therefore, two sediment samples were collected at two locations: one sample from each of two outfalls (49A and 49B), as shown in Figure 3-4. The discharge route for system #49 was verified by visually tracing the system prior to initiation of the sampling program.

The results of the chemical analyses performed on the sediment samples collected from system #49 are presented in Table 3-49.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #49.

3.50 System #50

System #50 drains the western side of the southern section of the north/south runway. It also drains a portion of the northwest/southeast runway before it discharges into a wooded area located outside the western perimeter fence.

The Supplemental Work Plan proposed one water and two sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Therefore, one sediment sample was collected at one location: the outfall located at the end of the runway (50A), as shown in Figure 3-4. Due to lack of sediment in the system, only one sediment sample was collected. The discharge route for system #50 was verified by visually tracing the system prior to initiation of the sampling program.

The results of the chemical analyses performed on the sediment sample collected from system #50 are presented in Table 3-50.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #50.

3.51 System #51

System #51 drains the central portion of the northwest/southeast runway and discharges to a wooded area located outside the western perimeter fence.

The Supplemental Work Plan proposed one water and one sediment sample to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Therefore, one sediment sample was collected at one location: from an outfall located at the end of the runway (51A), as shown in Figure 3-4. The discharge route for system #51 was verified by visually tracing the system prior to initiation of the sampling program.

The results of the chemical analyses performed on the sediment sample collected from system #51 are presented in Table 3-51.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #51.

3.52 System #52

System #52 drains the western end of the east/west runway. It then drains to the south and discharges to a wooded area located beyond the perimeter fence.

The Supplemental Work Plan proposed one water and three sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water and little sediment in the system. Therefore, one sediment sample was collected at one location: from the outfall located at the end of the runway (52A), as shown in Figure 3-4. The discharge route for system #52 was verified by visually tracing the system prior to initiation of the sampling program.

The results of the chemical analyses performed on the sediment sample collected from system #52 are presented in Table 3-52.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. SA 31 is associated with system #52. No AREEs or AOCs are associated with system #52.

3.53 System #53

System #53 drains a portion of the west side of the MAAF. It then discharges to a wooded area located beyond the perimeter fence.

The Supplemental Work Plan proposed one water and one sediment sample to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Therefore, one sediment sample was collected at one location: from the outfall located at the end of the runway (53A), as shown in Figure 3-4. The discharge route for system #53 was verified by visually tracing the system prior to initiation of the sampling program.

The results of the chemical analyses performed on the sediment sample collected from system #53 are presented in Table 3-53.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. SA 31 is associated with system #53. No AREEs or AOCs are associated with system #53.

3.54 System #54

System #54 drains the northern end of the northwest/southeast runway. It then drains westerly to a wooded area located outside the perimeter fence.

The Supplemental Work Plan proposed one water and one sediment sample to be collected from this system. Field conditions required adjustment to the sampling plan because there was no water in the system. Therefore, one sediment sample was collected at one location: from the outfall located at the end of the runway (54A), as shown in Figure 3-4. The discharge route for system #54 was verified by visually tracing the system prior to initiation of the sampling program.

The results of the chemical analyses performed on the sediment sample collected from system #54 are presented in Table 3-54.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #54.

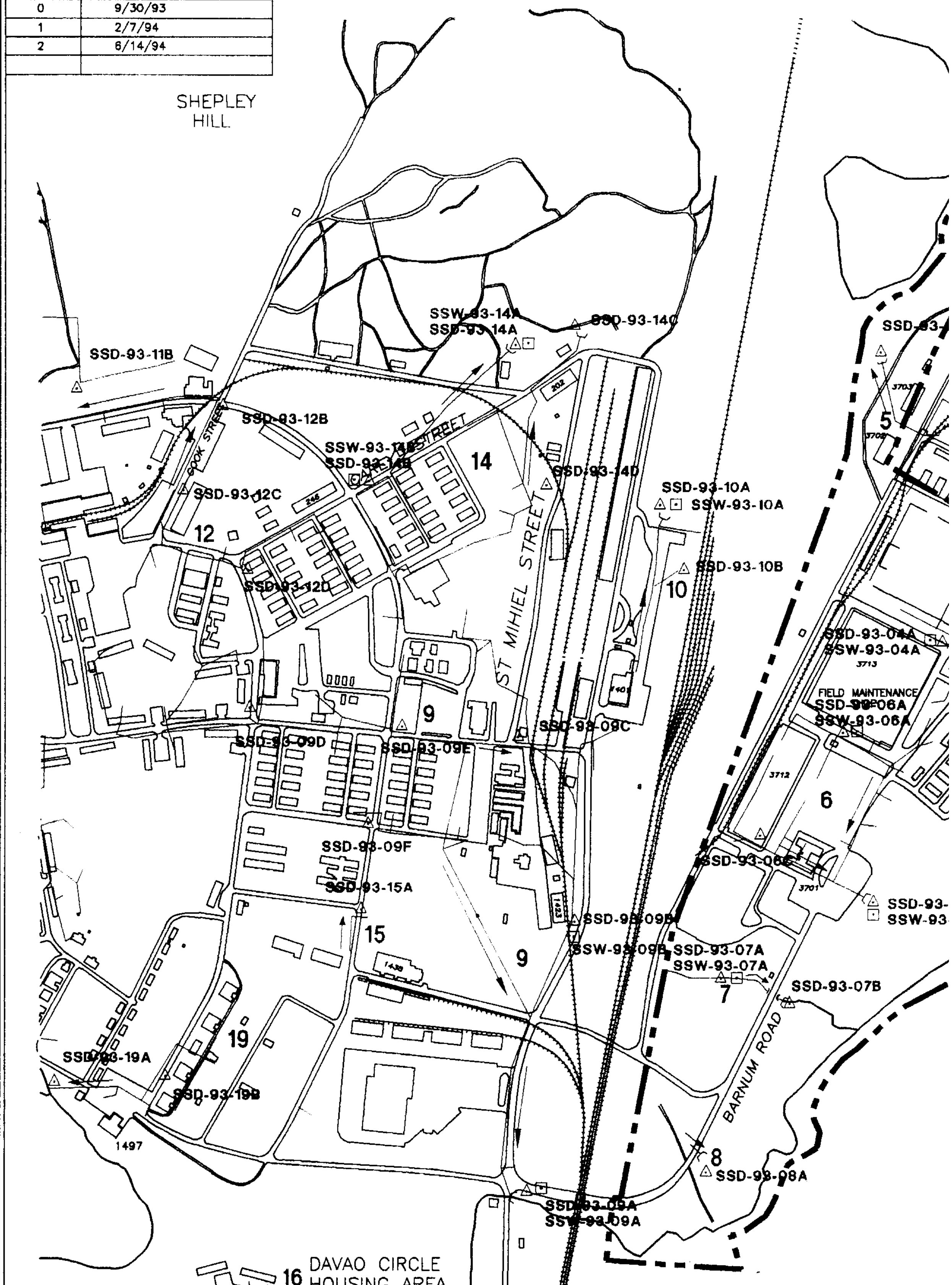
3.55 System #55

System #55 drains the northeast corner of the northwest/southeast runway.

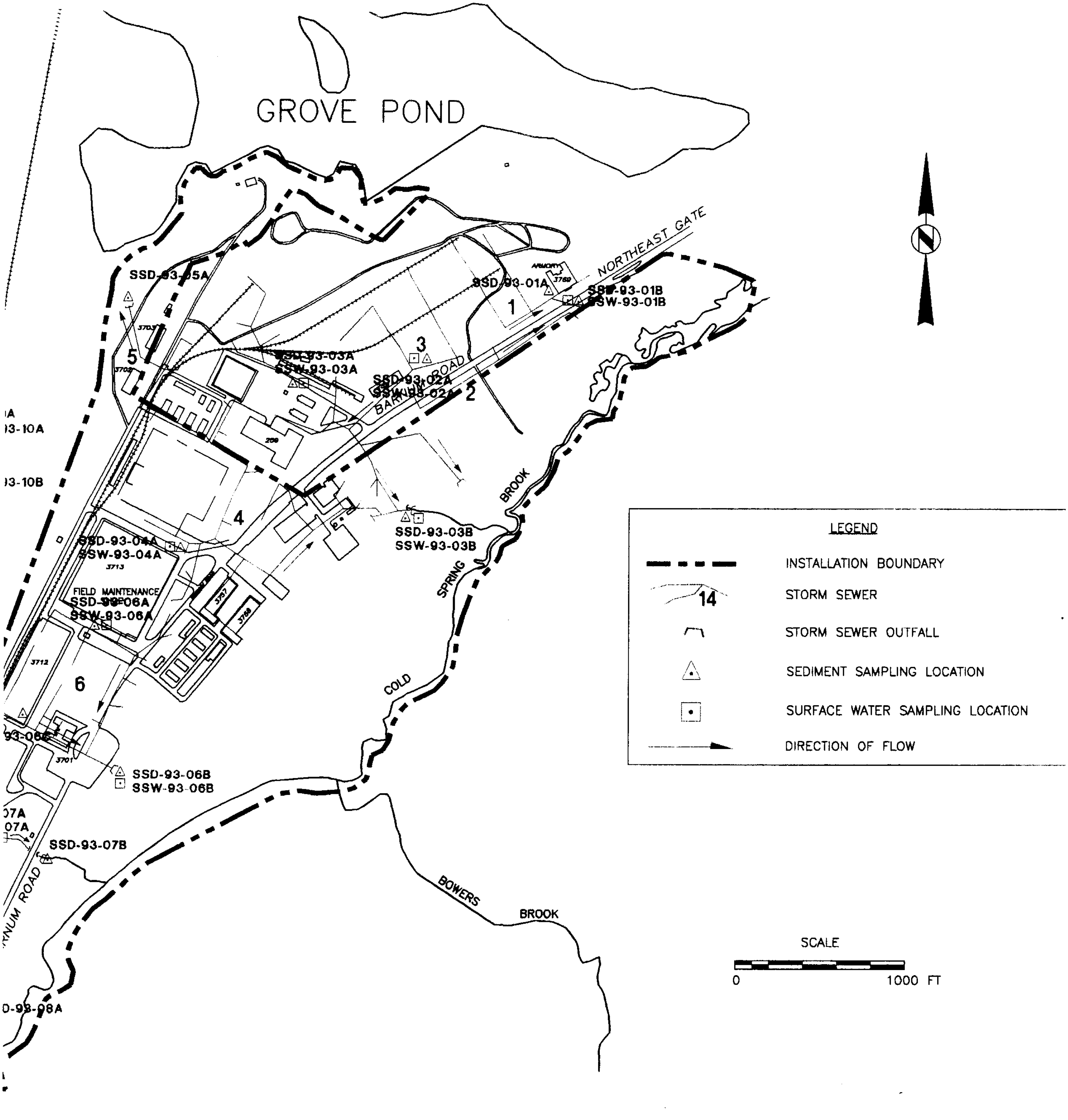
The Supplemental Work Plan proposed one water and three sediment samples to be collected from this system. Field conditions required adjustment to the sampling plan because the system outfall could not be located during route verification and there was no sediment or water present in any part of the system. Therefore, no samples were collected from this system.

A series of aerial photographs dating back to 1943 indicates that the site has always been used as an airfield. Current use remains as an airfield. There are no AOCs, SAs, or AREEs associated with system #55.

REV. #	REVISION DATE
0	9/30/93
1	2/7/94
2	6/14/94



PREPARED FOR: USAEC			DRAWN
DATE: JUNE 1994	SCALE: AS SHOWN	DWG. NO. 67065-104	APPROV



	DRAWN BY:
NO. 7065-104	APPROVED BY:

Arthur D Little
Cambridge, Massachusetts

FIGURE 3-1
STORM SEWER SYSTEM
1993 SAMPLING LOCATIONS

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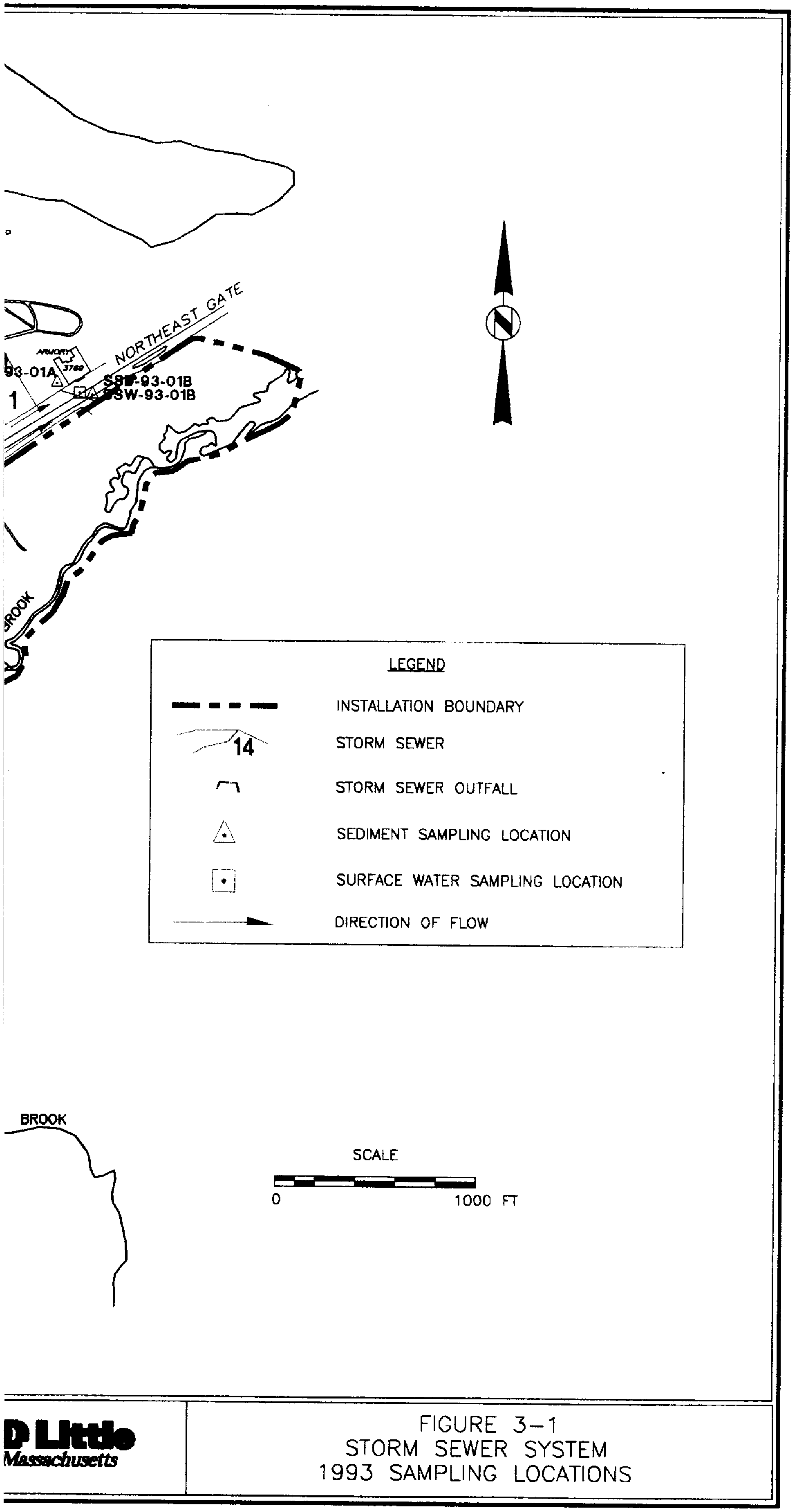
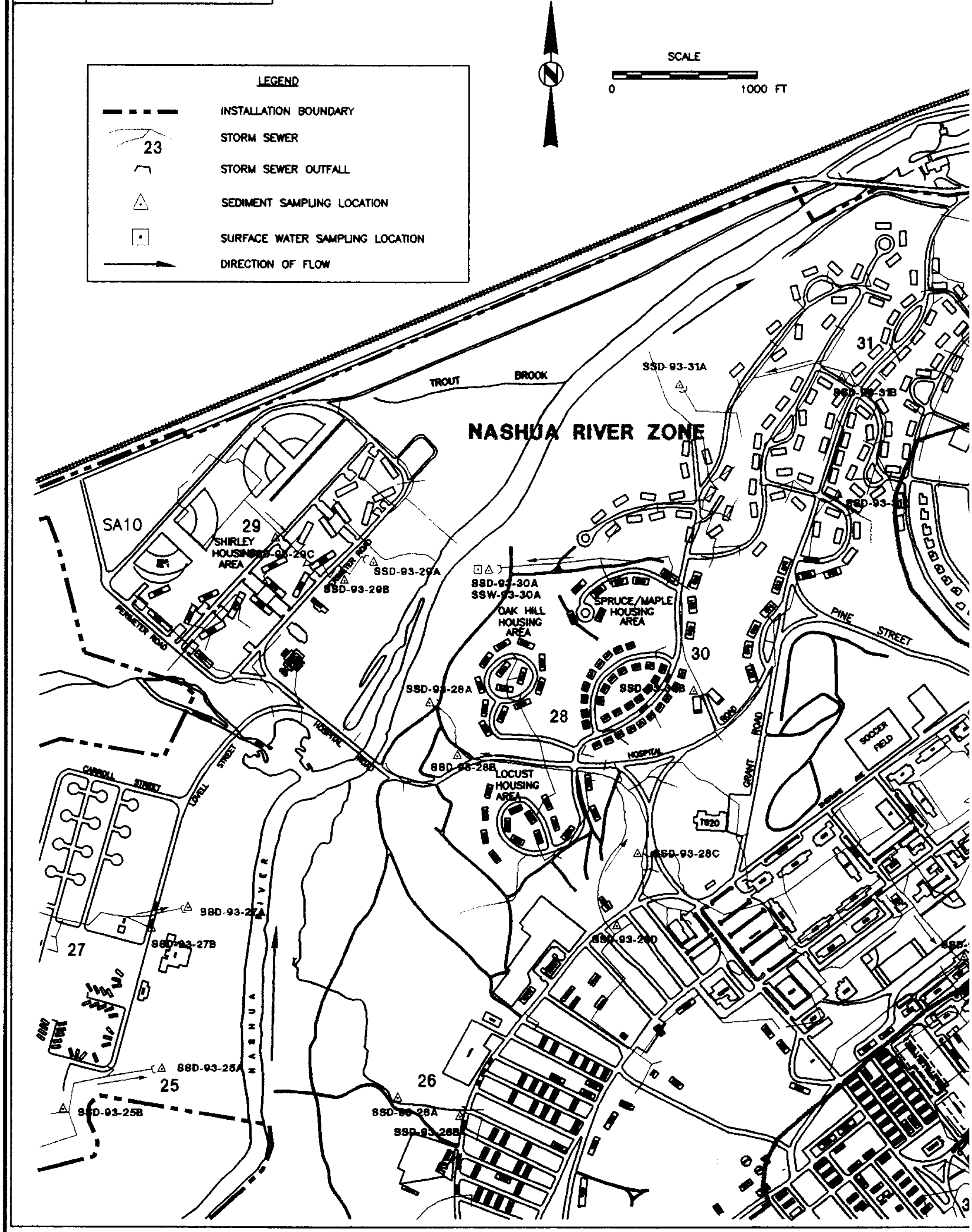
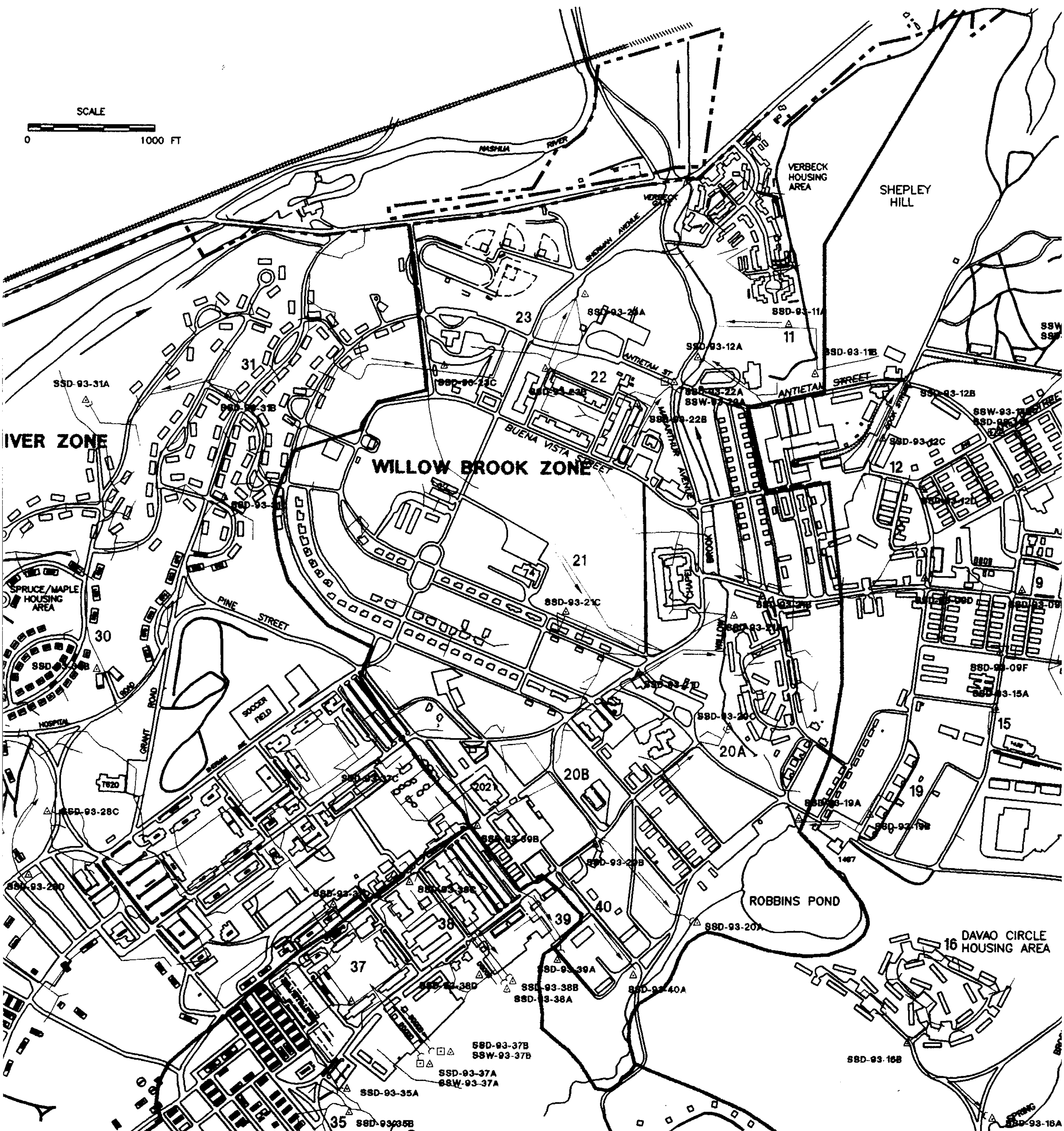


FIGURE 3–1
STORM SEWER SYSTEM
1993 SAMPLING LOCATIONS

REV. #	REVISION DATE
0	9/30/93
1	2/24/94
3	6/14/94



PREPARED FOR: USAEC			DRAWN BY:
DATE: JUNE 1994	SCALE: AS SHOWN	DWG. NO. 67065-103	APPROVED BY:



	DRAWN BY:		FIGURE 3–2
DWG. NO. 67065–103	APPROVED BY:	Arthur D Little Cambridge, Massachusetts	STORM SEWER SYSTEM 1993 SAMPLING LOCATIO

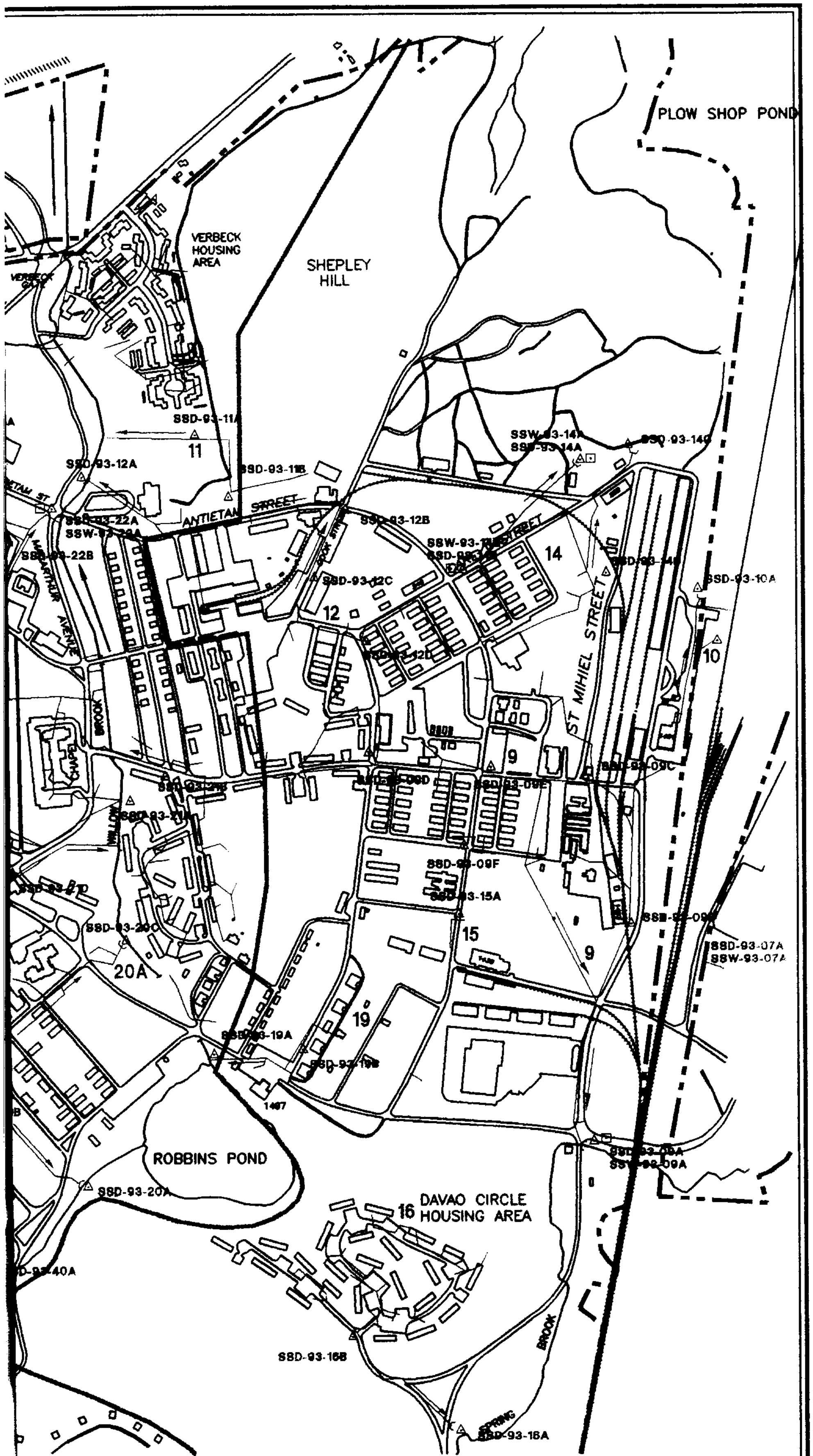
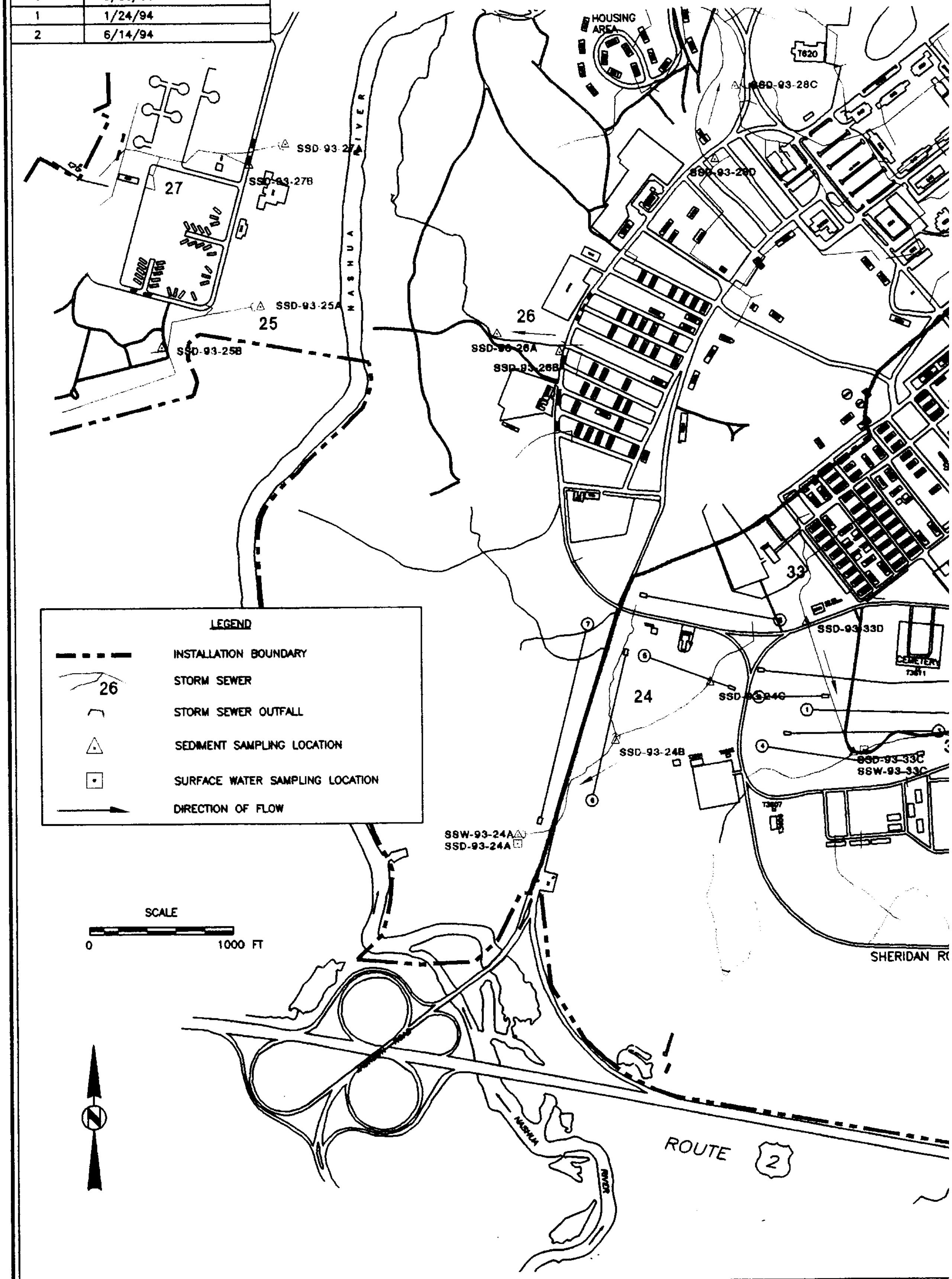
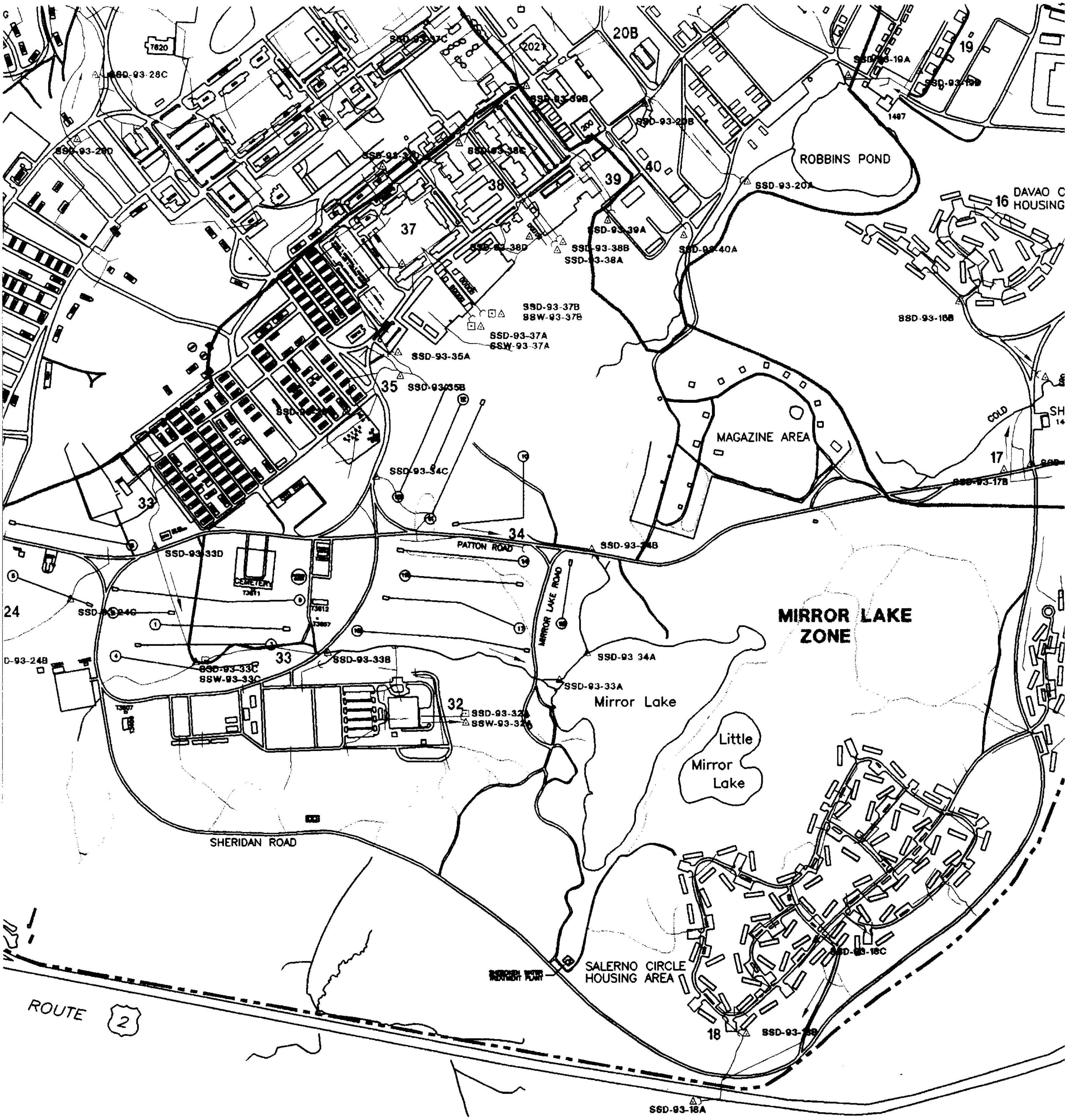


FIGURE 3–2
STORM SEWER SYSTEM
1993 SAMPLING LOCATIONS

REV. #	REVISION DATE
0	9/30/93
1	1/24/94
2	6/14/94



PREPARED FOR:	USAEC		DRAWN BY:
DATE: JUNE 1994	SCALE: AS SHOWN	DWG. NO. 67065–102	APPROVED BY:



	DRAWN BY:		
DWG. NO. 67065–102	APPROVED BY:	**Arthur D Little** *Cambridge, Massachusetts*	FIGURE 3–3 STORM SEWER SYSTEM 1993 SAMPLING LOCATION

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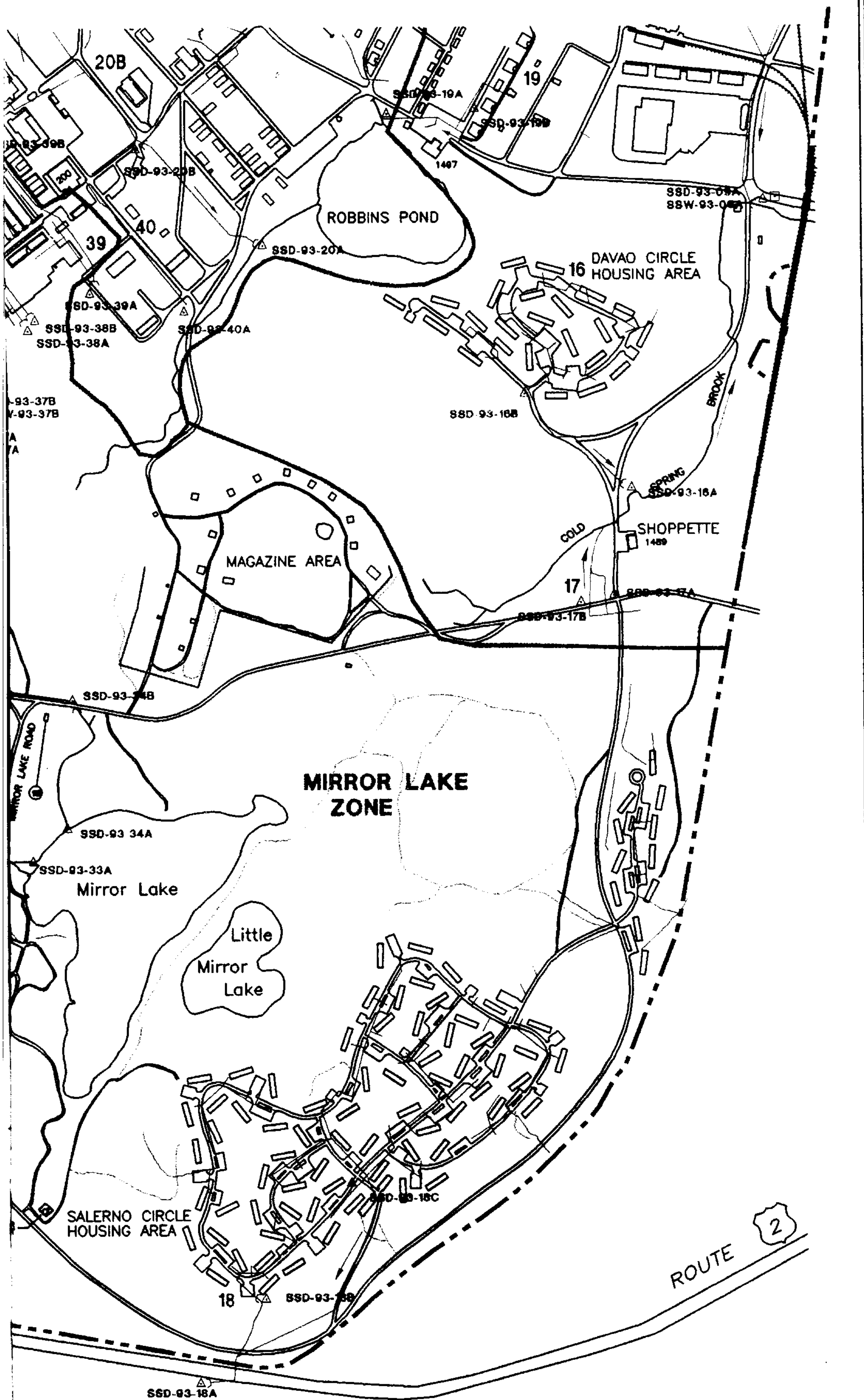

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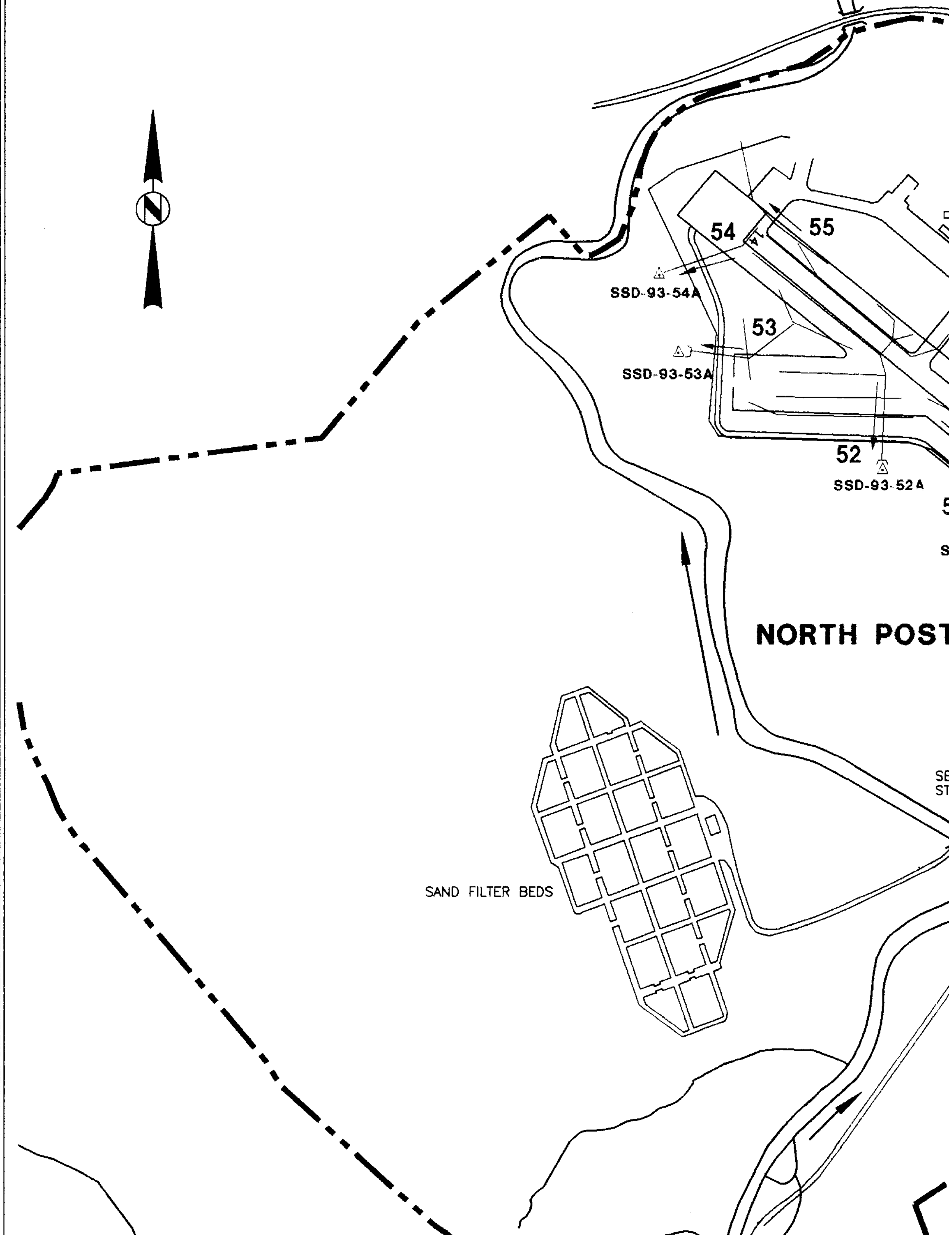
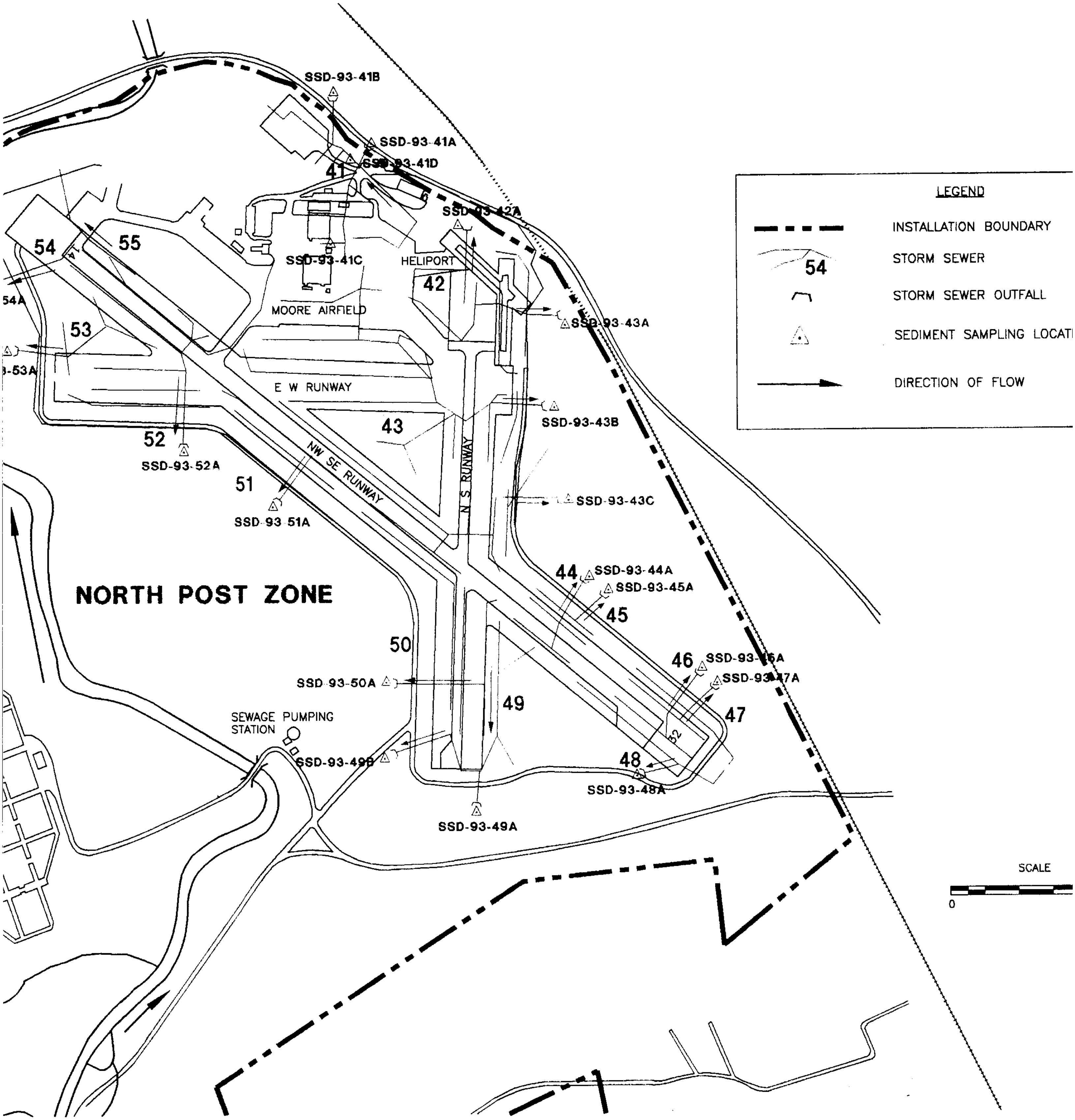
FIGURE 3-3
STORM SEWER SYSTEM
1993 SAMPLING LOCATIONS

REV. #	REVISION DATE
0	9/30/93
1	2/7/94
2	6/14/94



PREPARED FOR: USAEC			DRAWN
DATE: JUNE 1994	SCALE: AS SHOWN	DWG. NO. 67065-105	APPROV



	DRAWN BY:	Arthur D Little Cambridge, Massachusetts	FIGURE 3-4
DWG. NO. 67065-105	APPROVED BY:		STORM SEWER SYSTEM 1993 SAMPLING LOCATIO

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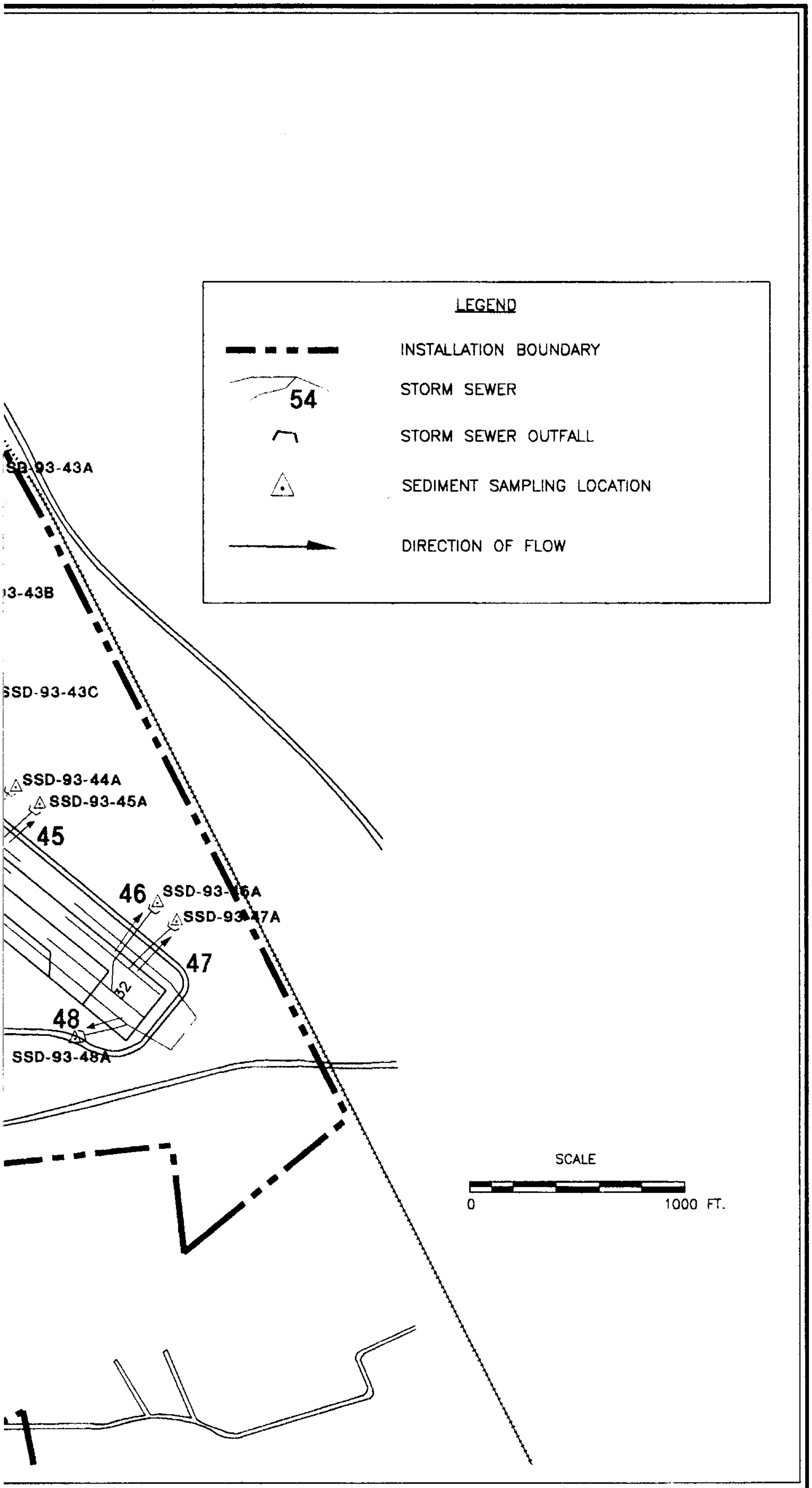

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FIGURE 3-4
STORM SEWER SYSTEM
1993 SAMPLING LOCATIONS

Table 3-0: Storm Sewer Systems #1-#55: Associated AREEs, AOCs, and SAs

System Number	SAs/AOCs	AREE 61 MWAAs	AREE 63 USTs	AREE 69 Past Spills
1				
2				
3	AOC 44, AOC 52, SA 38	AREE 61B, 61AU		
4	AOC 44, AOC 52	61X		69AU
5	AOC 44, AOC 52			
6	SA 38, SA 57	61X, 61AA		69AN, 69AS, 69AT
7				
8				
9	SA 29	61D(AP), 61AV, 61AX, 61AY	63F	69S
10		61E		69O
11		61BD		
12	SA 33, SA 34, SA 35	61AB, 61A, 61AD	63A, 63B	
13	System #13 was eliminated from this study because it is joined to system #12			
14	SA 48	61Z, 61AC, 61AE, 61BE, 61D (AP)		69AD, 69AI
15		61AY		
16				
17	SA 16, AOC 40			
18				
19	SA 2	61BF, 61AO, 61AH		
20	SA 43F, SA 43B, SA 43C, SA 43D	61C, 61AZ, 61AQ, 61AI, 61AR, 61F		

Table 3-0: Storm Sewer Systems #1-#55: Associated AREEs and SAs

System Number	SAs/AOCs	AREE 61 MWAAs	AREE 63 USTs	AREE 69 Past Spills
21		61AW		69R
22		61AK		
23		61AL, 61AK		
24		61N		
25	SA 55			
26	SA-58	61Q	63Y, 63AJ, 63AI, 63AG	69B
27	SA 43S, SA 51	61BB, 61BC, 61V		69F
28	SA 43P, SA 36, SA 43O (54)	61T, 61S, 61AN		
29	SA 10			
30				
31				
32	SA 1	61AM		
33	SA 43K, SA 49	61O, 61AM	63AX	
34				
35		61J		
36	SA 43I, SA 43H	61I		
37	SA 43Q, SA 43R, SA 43H, SA 43I	61I, 61U, 61AT		69AV
38	SA 43H	61H, 61I		
39	SA 43F	61C, 61AS, 61H		
40	AOC 43G	61G, 61AZ, 61AI, 61BA		69AP
41		61Y		
42	SA 50			
43	SA 47, SA 50	61Y		

Table 3-0: Storm Sewer Systems #1-#55: Associated AREEs and SAs

System Number	SAs/AOCs	AREE 61 MWAAs	AREE 63 USTs	AREE 69 Past Spills
44				
45				
46				
47				
48				
49				
50				
51				
52	SA 31			
53	SA 31			
54				
55				

Explanation of Sample Labeling System for Tables 3-1 through 3-55

Codes for Site ID:

SSD = Sediment Sampling Location
SSW = Surface Water Sampling Location

93 = Year

01 - 55 = Storm System Number

A - Z = Replicate Number

Codes for Field Sample Number:

Position	Description
1	D - Sediment W - Water
2	X - Regular Sample D - Duplicate Field Sample R - Rinse Blank T - Trip Blank F - Field Blank M - Matrix Spike Z - Matrix Spike Duplicate
3-4	00 - 99 Storm System Number
5-6	00 - 99 Replicate Number
7-8	00 - 99 Sample Depth

TABLE 3-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-01A	SSW-93-01A	SSD-93-01B
Field Sample ID	DX010100	WX0101X1	DX010200
Lab Sample ID	UA02091	UA02092	UA02101
Site Type	STSW	STSW	STSW
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	16-Aug-93	16-Aug-93	17-Aug-93
Total Organic Carbon (ug/g)	8500	NA	30000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	74	---	240
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	10900	1040	9620
Arsenic	10.6	---	15.5
Barium	32	20.9	27.1
Calcium	1540	5260	819
Chromium	48	---	24.5
Cobalt	6.42	---	4.7
Copper	33.5	764	44.5
Iron	28000	2450	16700
Lead	42	520	44
Magnesium	7480	719	4470
Manganese	217	234	203
Nickel	28.4	---	18
Potassium	1860	---	1700
Selenium	---	2.83	---
Sodium	110	2680	76.6
Vanadium	25.6	---	18.4
Zinc	45.5	170	62.9
Volatile Organic Compounds (ug/g Soil, ug/L Water)	---	---	---
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phosphorous Containing			
Dimethyl methylphosphonate	NA	---	NA
Diisopropyl methylphosphonate	NA	---	NA
Phthalates			
Bis (2-Ethyl hexyl) Phthalate	6.2 GT	---	---
Di-n-octyl Phthalate	0.88	---	---
Polynuclear Aromatics			
2-Methylnaphthalene	0.72	---	0.21
Acenaphthylene	---	---	5.8
Fluorene	---	---	2.3
Phenanthrene	50	---	30
Anthracene	9.7	---	7.1
Fluoranthrene	30	---	30
Pyrene	50	---	30 GT
Benzo (a) Anthracene	21	---	16
Chrysene	15	---	14
Benzo (b) Fluoranthene	13	---	11
Benzo (k) Fluoranthene	6.8	---	6.3
Benzo (a) Pyrene	9	---	8.4
Indeno (1,2,3,cd) Pyrene	9.9	---	8.9
Dibenzo (a,h) Anthracene	4.6	---	---
Benzo (ghi) Perylene	12	---	11
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA

Notes:
--- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-01A DX010100 UA02091 STSW 0 16-Aug-93	SSW-93-01A WX0101X1 UA02092 STSW 0 16-Aug-93	SSD-93-01B DX010200 UA02101 STSW 0 17-Aug-93
Water Quality Parameters			
pH	NA	4.56	NA
Conductivity (ms/cm)	NA	0.62	NA
Turbidity (NTU)	NA	10	NA
Dissolved Oxygen (mg/L)	NA	4.69	NA
Temperature (C)	NA	22.1	NA
Salinity (ppt)	NA	NA	NA
Total Suspended Solids (ug/L)	NA	13000	NA
Hardness (ug/L)	NA	16000	NA
Alkalinity (ug/L)	NA	---	NA
Nitrate/Nitrite (ug/L)	NA	1600	NA
Total Phosphorus (ug/L)	NA	29.2	NA
Total Kjedahl Nitrogen (ug/L)	NA	1180	NA
Anions (ug/L)			
Chloride	NA	1350	NA
Sulfate	NA	18000	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-02A	SSW-93-02A
Field Sample ID	DX020100	WX0201X1
Lab Sample ID	UA02102	UA02110
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	17-Aug-93	17-Aug-93
Total Organic Carbon (ug/g)	13000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	180	360
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	12300	1950
Arsenic	22.2	10.4
Barium	30.3	37.6
Beryllium	0.576	--
Calcium	7310	20900
Chromium	42.6	--
Cobalt	7.41	--
Copper	23.8	40.1
Iron	22900	3540
Lead	18	24.5
Magnesium	8460	1920
Manganese	283	141
Nickel	27.8	--
Potassium	1900	2470
Sodium	174	4300
Vanadium	31.8	--
Zinc	74.6	92.2
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phosphorous Containing		
Dimethyl methylphosphonate	NA	--
Diisopropyl methylphosphonate	NA	--
Polynuclear Aromatics		
Naphthalene		
2-Methylnaphthalene	0.22	--
Acenaphthylene	5.1	--
Acenaphthene	0.43	--
Phenanthrene	20	--
Anthracene	6.5	--
Fluoranthrene	20	--
Pyrene	30	--
Benzo (a) Anthracene	12	--
Chrysene	15	--
Benzo (b) Fluoranthene	10	--
Benzo (k) Fluoranthene	9.6	--
Benzo (a) Pyrene	8.4	--
Indeno (1,2,3,cd) Pyrene	5.3	--
Benzo (ghi) Perylene	7	--
Pesticides/PCBs (ug/g Soil, ug/L Water) not analyzed	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-02A DX020100 UA02102 STSW 0 17-Aug-93	SSW-93-02A WX0201X1 UA02110 STSW 0 17-Aug-93
Water Quality Parameters		
pH	NA	6.51
Conductivity (ms/cm)	NA	0.121
Turbidity (NTU)	NA	7
Dissolved Oxygen (mg/L)	NA	8.97
Temperature (C)	NA	22.4
Salinity (ppt)	NA	NA
Total Suspended Solids (ug/L)	NA	74000
Hardness (ug/L)	NA	59000
Alkalinity (ug/L)	NA	23000
Nitrate/Nitrite (ug/L)	NA	860
Total Phosphorus (ug/L)	NA	186
Total Kjedahl Nitrogen (ug/L)	NA	951
Anions (ug/L)		
Chloride	NA	2700
Sulfate	NA	19000

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-03A DX030100 UA02103 STSW 0 17-Aug-93	SSW-93-03A WX0301X1 UA02111 STSW 0 17-Aug-93	SSD-93-03B DX030200 UA02105 STSW 0 17-Aug-93	SSW-93-03B WX0302X1 UA02142 STSW 0 18-Aug-93
Total Organic Carbon (ug/g)	26000	NA	66000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	2000	150	1200	--
Inorganic Compounds (ug/g Soil, ug/L Water)				
Aluminum	16800	1130	9380	156
Antimony	--	60	--	--
Arsenic	19.3	2.35	19.2	--
Barium	81.7	21.9	46.2	10.9
Beryllium	0.596	1.12	--	--
Boron	--	230	--	--
Cadmium	7.89	6.78	3.74	--
Calcium	4380	12600	2240	3720
Chromium	70	16.8	38.4	--
Cobalt	11.8	25	8	--
Copper	45.9	18.8	43.9	74.6
Iron	27000	1550	21900	180
Lead	170	12.7	230	46.9
Magnesium	8530	1080	4200	375
Manganese	333	85.1	572	96.2
Molybdenum	--	52.7	--	--
Nickel	37.7	32.1	22.3	--
Potassium	3250	1320	1140	--
Selenium	--	2.53	--	--
Silver	--	10	--	--
Sodium	342	2030	108	707
Tellurium	--	118	--	--
Thallium	--	125	--	--
Tin	--	59.9	--	--
Vanadium	63.3	27.6	28.2	--
Zinc	225	141	171	131

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-03A	SSW-93-03A	SSD-93-03B	SSW-93-03B
Field Sample ID	DX030100	WX0301X1	DX030200	WX0302X1
Lab Sample ID	UA02103	UA02111	UA02105	UA02142
Site Type	STSW	STSW	STSW	STSW
Sample Depth (ft)	0	0	0	0
QC Type				
Collection Date:	17-Aug-93	17-Aug-93	17-Aug-93	18-Aug-93
Volatile Organic Compounds (ug/g Soil, ug/L Water)				
Aromatics				
Benzene	--	1	--	--
Toluene	--	1	--	--
Ethylbenzene	--	1	--	--
m-Xylene	--	1	--	--
Xylenes	--	2	--	--
Styrene	--	5	--	--
Chlorinated Aromatics				
Chlorobenzene	--	1	--	--
1,3-Dichlorobenzene	--	1	--	--
Dichlorobenzene, nonspecific	--	2	--	--
Halogenated Organics				
Chloromethane	--	1.2	--	--
Bromomethane	--	14	--	--
Vinyl Chloride	--	12	--	--
Chloroethane	--	8	--	--
Methylene Chloride	--	1	--	--
1,1-Dichloroethene	--	1	--	--
1,1-Dichloroethane	--	1	--	--
1,2-Dichloroethylenes (cis and trans isomers)	--	5	--	--
Chloroform	--	1	--	--
1,2-Dichloroethane	--	1	--	--
1,1,1-Trichloroethane	--	1	--	--
Carbon Tetrachloride	--	1	--	--
Bromodichloromethane	--	1	--	--
1,2-Dichloropropane	--	1	--	--
Trichloroethene	--	1	--	--
1,3-Dichloropropane	--	4.8	--	--
Dibromochloromethane	--	1	--	--
1,1,2-Trichloroethane	--	1	--	--
2-Chloroethylvinyl Ether	--	3.5	--	--
Bromoform	--	11	--	--
1,1,2,2-Tetrachloroethane	--	1.5	--	--
Tetrachloroethene	--	1	0.24	--
Carbon Disulfide	--	5	--	--
cis-1,3-Dichloropropene	--	5	--	--
trans-1,3-Dichloropropene	--	5	--	--
Water Solubles				
Acetone	--	37	--	--
2-Butanone	--	10	--	--
4-Methyl-2-Pentanone	--	1.4	--	--
2-Hexanone	--	1	--	--
Other				
Acrylonitrile	--	8.4	--	--
Trichlorofluoromethane	--	1	--	--
Vinyl Acetate	--	1	--	--

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-03A	SSW-93-03A	SSD-93-03B	SSW-93-03B
Field Sample ID	DX030100	WX0301X1	DX030200	WX0302X1
Lab Sample ID	UA02103	UA02111	UA02105	UA02142
Site Type	STSW	STSW	STSW	STSW
Sample Depth (ft)	0	0	0	0
QC Type				
Collection Date:	17-Aug-93	17-Aug-93	17-Aug-93	18-Aug-93
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Phenols				
2-Methyl Phenol	0.31	--	0.35	--
4-Methyl Phenol	1.1	--	2.2	--
Dibenzofuran	3.7	--	2.6	--
Phosphorous Containing				
Dimethyl methylphosphonate	NA	--	NA	--
Diisopropyl methylphosphonate	NA	--	NA	--
Phthalates				
Bis (2-Ethyl hexyl) Phthalate	90	--		--
Polynuclear Aromatics				
Naphthalene	7.5	--	3.6	--
2-Methylnaphthalene	2.4	--	2.1	--
Acenaphthylene	12	--	30	--
Acenaphthene	3.8	--	3.6	--
Fluorene	9.6	--	8.1	--
Phenanthrene	70	--	100	--
Anthracene	20	--	6.2 GT	--
Fluoranthrene	50	--	100	--
Pyrene	50	--	200	--
Benzo (a) Anthracene	30	--	60	--
Chrysene	40	--	90	--
Benzo (b) Fluoranthene	28	--	60	--
Benzo (k) Fluoranthene	17	--	70	--
Benzo (a) Pyrene	30	--	60	--
Indeno (1,2,3,cd) Pyrene	19	--	--	--
Dibenzo (a,h) Anthracene	1.1	--	1.7	--
Benzo (ghi) Perylene	18	--	30	--
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-03A DX030100 UA02103 STSW 0 17-Aug-93	SSW-93-03A WX0301X1 UA02111 STSW 0 17-Aug-93	SSD-93-03B DX030200 UA02105 STSW 0 17-Aug-93	SSW-93-03B WX0302X1 UA02142 STSW 0 18-Aug-93
Water Quality Parameters				
pH	NA	6.66	NA	6.13
Conductivity (ms/cm)	NA	0.072	NA	0.18
Turbidity (NTU)	NA	10	NA	7.7
Dissolved Oxygen (mg/L)	NA	6.95	NA	7.99
Temperature (C)	NA	23.6	NA	20
Salinity (ppt)	NA	0	NA	0
Total Suspended Solids (ug/L)	NA	30000	NA	--
Hardness (ug/L)	NA	35000	NA	11000
Alkalinity (ug/L)	NA	7900	NA	--
Nitrate/Nitrite (ug/L)	NA	1900	NA	68
Total Phosphorus (ug/L)	NA	52.7	NA	16.1
Total Kjedahl Nitrogen (ug/L)	NA	789	NA	421
Anions (ug/L)				
Chloride	NA	1010	NA	992
Sulfate	NA	17000	NA	8050

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-4
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-04A DX040100 UA02104 STSW 0 17-Aug-93	SSW-93-04A WX0401X1 UA02112 STSW 0 17-Aug-93
Total Organic Carbon (ug/g)	36000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	1700	1300
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	7450	892
Arsenic	30.5	--
Barium	15.7	24.4
Cadmium	7.45	--
Calcium	2290	8130
Chromium	30	--
Cobalt	6.77	--
Copper	22.8	--
Iron	28800	1860
Lead	51	25.1
Magnesium	4670	864
Manganese	221	142
Nickel	23	--
Potassium	601	--
Sodium	63.4	1330
Vanadium	27.8	--
Zinc	78.7	332
Volatile Organic Compounds (ug/g Soil, ug/L Water)		
Water Solubles		
Acetone	--	35
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phosphorus Containing		
Dimethyl methylphosphonate	NA	--
Diisopropyl methylphosphonate	NA	--
Polynuclear Aromatics		
Naphthalene		
Acenaphthylene	0.56	--
Fluorene	0.21	--
Phenanthrene	1.9	--
Fluoranthrene	1.6	--
Pyrene	1.8	--
Benzo (a) Anthracene	1	--
Chrysene	1.2	--
Benzo (b) Fluoranthene	1.2	--
Benzo (k) Fluoranthene	0.84	--
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA

Notes:
-- = Not detected or less dection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-4
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-04A	SSW-93-04A
Field Sample ID	DX040100	WX0401X1
Lab Sample ID	UA02104	UA02112
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	17-Aug-93	17-Aug-93
Water Quality Parameters		
pH	NA	5.7
Conductivity (ms/cm)	NA	0.064
Turbidity (NTU)	NA	5
Dissolved Oxygen (mg/L)	NA	8.94
Temperature (C)	NA	23.8
Salinity (ppt)	NA	NA
Total Suspended Solids (ug/L)	NA	25000
Hardness (ug/L)	NA	24000
Alkalinity (ug/L)	NA	5300
Nitrate/Nitrite (ug/L)	NA	1200
Total Phosphorus (ug/L)	NA	18.7
Total Kjedahl Nitrogen (ug/L)	NA	950
Anions (ug/L)		
Chloride	NA	1230
Sulfate	NA	13000

Notes:
-- = Not detected or less deciton limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-5
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-05A
Field Sample ID	DX050100
Lab Sample ID	UA02107
Site Type	STSW
Sample Depth (ft)	0
QC Type	
Collection Date:	17-Aug-93
Total Organic Carbon (ug/g)	55000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	3200
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	30400
Arsenic	43
Barium	99
Beryllium	1.62
Cadmium	4.59
Calcium	6960
Chromium	163
Cobalt	28.8
Copper	65.6
Iron	48700
Lead	160
Magnesium	17500
Manganese	1300
Nickel	82
Potassium	5950
Sodium	270
Vanadium	88.6
Zinc	301
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phosphorous Containing	
Dimethyl methylphosphonate	NA
Diisopropyl methylphosphonate	NA
Polynuclear Aromatics	
Naphthalene	
Acenaphthylene	3.8
Acenaphthene	0.21
Fluorene	0.91
Phenanthrene	8.4
Anthracene	4.5
Fluoranthrene	7.3
Pyrene	12
Benzo (a) Anthracene	5.9
Chrysene	7.4
Benzo (b) Fluoranthene	6.9
Benzo (k) Fluoranthene	6.2
Benzo (a) Pyrene	5.8
Benzo (ghi) Perylene	5
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-5
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-05A DX050100 UA02107 STSW 0 17-Aug-93
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjedahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-6
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-06A	SSW-93-06A	SSD-93-06B	SSD-93-06B	SSW-93-06B	SSD-93-06C
Field Sample ID	DX060100	WX0601X1	DD060200	DX060200	WX0602X1	DX060300
Lab Sample ID	UA02106	UA02113	UA02134	UA02133	UA02144	UA02632
Site Type	STSW	STSW	STSW	STSW	STSW	STSW
Sample Depth (ft)	0	0	0	0	0	0
QC Type			Duplicate			
Collection Date:	17-Aug-93	17-Aug-93	18-Aug-93	18-Aug-93	18-Aug-93	03-Sep-93
Total Organic Carbon (ug/g)	44000	NA	NA	75000	NA	25000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	5300	3300	2600	3500	--	160
Inorganic Compounds (ug/g Soil, ug/L Water)						
Aluminum	9920	2510	9680	5750	177	6480
Arsenic	52	5.62	20.9	10.3	--	9.96
Barium	26.3	20.2	69	24	7.86	23.9
Cadmium	5.93	9.53	3.82	--	--	--
Calcium	6220	5520	1760	1190	1900	1470
Chromium	23	--	64.6	27.1	--	9.99
Cobalt	7.19	--	7.39	4.23	--	4.09
Copper	37.4	--	105	40.7	--	11.5
Iron	21900	4730	21800	14900	86.9	10700
Lead	35	27.2	420	140	69.1	33
Magnesium	5730	1400	3770	2500	211	2290
Manganese	354	121	320	184	122	191
Nickel	21.4	--	22.8	14.1	--	13.5
Potassium	1380	--	1670	885	--	708
Sodium	67.4	1050	138	76.2	492	78.8
Tin	--	--	13.5	--	--	--
Vanadium	47.6	--	36.8	16.8	--	9.06
Zinc	126	250	189	83.1	116	28.4
Volatile Organic Compounds (ug/g Soil, ug/L Water)						
Water Solubles						
Acetone	--	49	--	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)						
Phosphorous Containing						
Dimethyl methylphosphonate	NA	--	NA	NA	--	NA
Diisopropyl methylphosphonate	NA	--	NA	NA	--	NA
Phthalates						
Di-n-butyl Phthalate	--	--	6.2 GT	9.3	--	--
Bis (2-Ethyl hexyl) Phthalate	--	--	--	1.4	--	--
Polynuclear Aromatics						
Naphthalene						
2-Methylnaphthalene	0.16	--	0.15	0.19	--	0.057
Acenaphthylene	2.2	--	2.7	3.2	--	1.2
Acenaphthene	0.26	--	0.18	0.22	--	0.28
Fluorene	1.2	--	--	0.61	--	0.45
Phenanthrene	10	--	3.2	4.6	--	5.7
Anthracene	3.5	--	2.5	3	--	1.5
Fluoranthrene	5.6	--	4	5.2	--	5.7
Pyrene	6.8	--	4.6	5.9	--	7.3
Benzo (a) Anthracene	3.9	--	2.7	3.5	--	5
Chrysene	3.9	--	3.3	4.3	--	4.9
Benzo (b) Fluoranthene	4	--	3.5	4.9	--	4.4
Benzo (k) Fluoranthene	3.3	--	3	3.6	--	4.4
Benzo (a) Pyrene	3.4	--	3.1	4.1	--	3.4
Dibenzo (a,h) Anthracene	--	--	--	0.83	--	--
Benzo (ghi) Perylene	2	--	3.1	4.9	--	3

Notes:
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SSD = Sediment
SSW = Surface Water

TABLE 3-6
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-06A DX060100 UA02106 STSW 0 17-Aug-93	SSW-93-06A WX0601X1 UA02113 STSW 0 17-Aug-93	SSD-93-06B DD060200 UA02134 STSW 0 Duplicate 18-Aug-93	SSD-93-06B DX060200 UA02133 STSW 0 18-Aug-93	SSW-93-06B WX0602X1 UA02144 STSW 0 18-Aug-93	SSD-93-06C DX060300 UA02632 STSW 0 03-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA	NA	NA	NA
Water Quality Parameters						
pH	NA	6.05	NA	NA	4.45	NA
Conductivity (ms/cm)	NA	0.023	NA	NA	0.032	NA
Turbidity (NTU)	NA	80	NA	NA	0	NA
Dissolved Oxygen (mg/L)	NA	7	NA	NA	10.31	NA
Temperature (C)	NA	25.6	NA	NA	20.7	NA
Salinity (ppt)	NA	NA	NA	NA	NA	NA
Total Suspended Solids (ug/L)	NA	66000	NA	NA	--	NA
Hardness (ug/L)	NA	19000	NA	NA	5500	NA
Alkalinity (ug/L)	NA	7600	NA	NA	--	NA
Nitrate/Nitrite (ug/L)	NA	570	NA	NA	670	NA
Total Phosphorus (ug/L)	NA	84.1	NA	NA	37	NA
Total Kjedahl Nitrogen (ug/L)	NA	694	NA	NA	503	NA
Anions (ug/L)						
Chloride	NA	829	NA	NA	1020	NA
Sulfate	NA	4460	NA	NA	7280	NA

Notes:
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SSD = Sediment
SSW = Surface Water

TABLE 3-7
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-07A DX070100 UA02135 STSW 0 18-Aug-93	SSW-93-07A WX0701X1 UA02145 STSW 0 18-Aug-93	SSD-93-07B DX070200 UA02137 STSW 0 18-Aug-93
Total Organic Carbon (ug/g)	9600	NA	1500000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	250	--	300
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	6760	255	20900
Arsenic	9.91	--	41.6
Barium	9.65	35.6	545
Beryllium	--	--	8.35
Cadmium	--	--	10.6
Calcium	6450	10300	6910
Chromium	18.6	--	9.64
Cobalt	4.39	--	298
Copper	20.6	--	36.2
Iron	15900	513	67800
Lead	26	--	91
Magnesium	2960	1200	923
Manganese	189	802	25000
Nickel	13.7	--	140
Potassium	544	1530	--
Sodium	67.2	16900	455
Vanadium	10.8	--	24.6
Zinc	46.9	--	415
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phosphorous Containing			
Dimethyl methylphosphonate	NA	--	NA
Diisopropyl methylphosphonate	NA	--	NA
Phthalates			
Di-n-butyl Phthalate	5.5	--	22
Polynuclear Aromatics			
Acenaphthylene	0.36	--	--
Phenanthrene	1	--	--
Fluoranthrene	1	--	1
Pyrene	1.5	--	--
Benzo (a) Anthracene	0.64	--	--
Chrysene	0.84	--	--
Benzo (k) Fluoranthene	0.76	--	--
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-7
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-07A DX070100 UA02135 STSW 0 18-Aug-93	SSW-93-07A WX0701X1 UA02145 STSW 0 18-Aug-93	SSD-93-07B DX070200 UA02137 STSW 0 18-Aug-93
Water Quality Parameters			
pH	NA	6.3	NA
Conductivity (ms/cm)	NA	0.13	NA
Turbidity (NTU)	NA	0	NA
Dissolved Oxygen (mg/L)	NA	5.94	NA
Temperature (C)	NA	17.7	NA
Salinity (ppt)	NA	0	NA
Total Suspended Solids (ug/L)	NA	--	NA
Hardness (ug/L)	NA	30000	NA
Alkalinity (ug/L)	NA	13000	NA
Nitrate/Nitrite (ug/L)	NA	300	NA
Total Phosphorus (ug/L)	NA	--	NA
Total Kjedahl Nitrogen (ug/L)	NA	174	NA
Anions (ug/L)			
Chloride	NA	22000	NA
Sulfate	NA	13000	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-8
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-08A
Field Sample ID	DX080100
Lab Sample ID	UA02136
Site Type	STSW
Sample Depth (ft)	0
QC Type	
Collection Date:	18-Aug-93
Total Organic Carbon (ug/g)	66000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	780
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	14300
Arsenic	13.2
Barium	49.2
Beryllium	0.945
Calcium	1510
Chromium	38
Cobalt	13.8
Copper	26
Iron	19200
Lead	110
Magnesium	3040
Manganese	595
Nickel	17.9
Potassium	1430
Sodium	121
Vanadium	26.4
Zinc	190
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phosphorous Containing	
Dimethyl methylphosphonate	NA
Diisopropyl methylphosphonate	NA
Phthalates	
Di-n-butyl Phthalate	2.1
Polynuclear Aromatics	
Phenanthrene	0.48
Fluoranthrene	0.53
Pyrene	0.45
Chrysene	0.4
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-8
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-08A DX080100 UA02136 STSW 0 18-Aug-93
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjedahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-9
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-09A DX090100 UA02118 STSW 0 19-Aug-93	SSW-93-09A WX0901X1 UA02127 STSW 0 19-Aug-93	SSD-93-09B DX090200 UA02122 STSW 0 19-Aug-93	SSW-93-09B WX0902X1 UA02131 STSW 0 19-Aug-93	SSD-93-09C DX090300 UA02138 STSW 0 18-Aug-93
Total Organic Carbon (ug/g)	51000	NA	10000	NA	66000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	270	--	430	210	2600
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	5850	426	4570	860	6770
Arsenic	17.5	15.8	15.3	2.71	--
Barium	19.5	27.5	13.4	12.3	18.4
Calcium	1080	20200	1020	7890	1230
Chromium	17.4	--	9.66	--	23.8
Cobalt	3.14	--	--	--	4.13
Copper	11.1	--	12.8	--	16.4
Iron	14200	4560	9360	1680	12900
Lead	53	--	280	17.4	68
Magnesium	3030	2230	1390	1230	2740
Manganese	108	468	86.3	75.8	142
Nickel	13.6	--	7.86	--	12.3
Potassium	672	2330	697	--	876
Sodium	98	33000	68.2	7070	130
Vanadium	12.6	--	10.3	--	17.9
Zinc	43.6	48	57.4	106	62.4
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phosphorous Containing					
Dimethyl methylphosphonate	NA	--	NA	--	NA
Diisopropyl methylphosphonate	NA	--	NA	--	NA
Phthalates					
Di-n-butyl Phthalate	--	--	--	--	4.1
Polynuclear Aromatics					
2-Methylnaphthalene	--	--	--	--	--
Acenaphthylene	--	--	0.52	--	0.4
Acenaphthene	--	--	0.11	--	--
Fluorene	--	--	0.26	--	--
Phenanthrene	3	--	2.6	--	0.5
Anthracene	8	--	--	--	--
Fluoranthrene	4	--	2.1	--	0.65
Pyrene	5	--	3.4	--	0.64
Benzo (a) Anthracene	2	--	1.6	--	0.39
Chrysene	3	--	1.9	--	0.56
Benzo (b) Fluoranthene	--	--	1.4	--	--
Benzo (k) Fluoranthene	--	--	1.5	--	0.46
Benzo (a) Pyrene	--	--	--	--	--
Indeno (1,2,3,cd) Pyrene	--	--	--	--	--
Dibenzo (a,h) Anthracene	--	--	--	--	--
Benzo (ghi) Perylene	--	--	--	--	--

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-9
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-09A	SSW-93-09A	SSD-93-09B	SSW-93-09B	SSD-93-09C
Field Sample ID	DX090100	WX0901X1	DX090200	WX0902X1	DX090300
Lab Sample ID	UA02118	UA02127	UA02122	UA02131	UA02138
Site Type	STSW	STSW	STSW	STSW	STSW
Sample Depth (ft)	0	0	0	0	0
QC Type					
Collection Date:	19-Aug-93	19-Aug-93	19-Aug-93	19-Aug-93	18-Aug-93
Pesticides/PCBs (ug/g Soil, ug/L Water)					
alpha-BHC	--	--	--	0.003	--
Endosulfan I	--	--	--	0.015	--
beta-BHC	--	--	--	0.019	--
Endosulfan II	--	--	--	--	0.002
delta-BHC	--	--	--	0.016	--
Dieldrin	0.021	--	0.018	0.049	0.005
Endrin Aldehyde	NA	--	NA	--	NA
Endrin Ketone	--	--	--	--	--
Heptachlor	--	--	--	0.004	--
Isodrin	--	--	--	0.004	--
Lindane	--	--	--	0.003	--
p,p'-DDD	0.104	0.008	0.005	--	0.005
p,p'-DDE	0.015	0.006	--	0.005	--
p,p'-DDT	0.24	0.004	0.009	0.014	0.013
Water Quality Parameters					
pH	NA	6.65	NA	6.7	NA
Conductivity (ms/cm)	NA	0.256	NA	0.07	NA
Turbidity (NTU)	NA	10	NA	1	NA
Dissolved Oxygen (mg/L)	NA	4.5	NA	7.2	NA
Temperature (C)	NA	19.2	NA	21	NA
Salinity (ppt)	NA	0.01	NA	0	NA
Total Suspended Solids (ug/L)	NA	43000	NA	8000	NA
Hardness (ug/L)	NA	59000	NA	24000	NA
Alkalinity (ug/L)	NA	36000	NA	9000	NA
Nitrate/Nitrite (ug/L)	NA	75.4	NA	440	NA
Total Phosphorus (ug/L)	NA	47.5	NA	73.7	NA
Total Kjedahl Nitrogen (ug/L)	NA	355	NA	109	NA
Anions (ug/L)					
Chloride	NA	47000	NA	9400	NA
Sulfate	NA	15000	NA	10000	NA

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-9
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-09D	SSD-93-09E	SSD-93-09F
Field Sample ID	DX090400	DX090500	DX090600
Lab Sample ID	UA02124	UA02116	UA02170
Site Type	STSW	STSW	STSW
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	19-Aug-93	19-Aug-93	20-Aug-93
Total Organic Carbon (ug/g)	90000	55000	34000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	550	1300	890
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	9720	6250	4440
Arsenic	10.9	3.64	--
Barium	50.1	26.1	13
Calcium	4490	4500	1150
Chromium	36.8	17.5	13.6
Cobalt	10.3	5.38	3.35
Copper	27.4	23.5	8.78
Iron	18800	14900	11200
Lead	140	58	25
Magnesium	4280	2710	2460
Manganese	291	170	88.2
Nickel	22.3	13.6	9.85
Potassium	1240	792	761
Sodium	147	117	63.1
Vanadium	26.7	17.2	10.7
Zinc	225	147	58.4
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phosphorous Containing			
Dimethyl methylphosphonate	NA	NA	NA
Diisopropyl methylphosphonate	NA	NA	NA
Phthalates			
Di-n-butyl Phthalate	--	--	1.9
Polynuclear Aromatics			
2-Methylnaphthalene	0.15	0.072	--
Acenaphthylene	3.4	1.1	0.25
Acenaphthene	0.33	--	--
Fluorene	1.2	0.22	--
Phenanthrene	9.9	3.6	0.66
Anthracene	5.9	--	--
Fluoranthrene	8.7	5.2	0.67
Pyrene	13	6.8	0.55
Benzo (a) Anthracene	9.2	17	0.41
Chrysene	9.4	0.17	0.5
Benzo (b) Fluoranthene	10	--	--
Benzo (k) Fluoranthene	7.7	--	--
Benzo (a) Pyrene	8.7	--	--
Indeno (1,2,3,cd) Pyrene	--	--	--
Dibenzo (a,h) Anthracene	1	--	--
Benzo (ghi) Perylene	4.5	--	--

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-9
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-09D	SSD-93-09E	SSD-93-09F
Field Sample ID	DX090400	DX090500	DX090600
Lab Sample ID	UA02124	UA02116	UA02170
Site Type	STSW	STSW	STSW
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	19-Aug-93	19-Aug-93	20-Aug-93
Pesticides/PCBs (ug/g Soil, ug/L Water)			
alpha-BHC	--	--	--
Endosulfan I	--	--	--
beta-BHC	--	--	--
Endosulfan II	--	--	--
delta-BHC	--	--	--
Dieldrin	0.028	0.025	0.004
Endrin Aldehyde	NA	NA	NA
Endrin Ketone	0.003	0.003	--
Heptachlor	--	--	--
Isodrin	--	--	--
Lindane	--	--	--
p,p'-DDD	0.043	--	0.004
p,p'-DDE	0.005	--	0.004
p,p'-DDT	0.022	--	0.009
Water Quality Parameters			
pH	NA	NA	NA
Conductivity (ms/cm)	NA	NA	NA
Turbidity (NTU)	NA	NA	NA
Dissolved Oxygen (mg/L)	NA	NA	NA
Temperature (C)	NA	NA	NA
Salinity (ppt)	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)			
Chloride	NA	NA	NA
Sulfate	NA	NA	NA

Notes:
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NA = Not Analyzed
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SSD = Sediment
SSW = Surface Water

TABLE 3-10
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-10A	SSW-93-10A	SSD-93-10B
Field Sample ID	DX100100	WX1001X1	DX100200
Lab Sample ID	UA02139	UA02147	UA02119
Site Type	STSW	STSW	STSW
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	18-Aug-93	18-Aug-93	19-Aug-93
Total Organic Carbon (ug/g)	17000	NA	66000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	80	640	7300
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	4770	997	6560
Arsenic	5.92	--	7.49
Barium	9.44	11.2	17.8
Calcium	428	4450	5740
Chromium	9.85	--	23.9
Cobalt	--	--	4.27
Copper	12.2	41.8	29.1
Iron	10600	1660	17500
Lead	12	19.8	43
Magnesium	1880	650	4140
Manganese	141	38.1	200
Nickel	8.93	--	15.1
Potassium	417	2040	591
Sodium	--	2220	68.6
Vanadium	6.8	--	18.2
Zinc	30.2	95.8	165
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phosphorous Containing			
Dimethyl methylphosphonate	NA	--	NA
Diisopropyl methylphosphonate	NA	--	NA
Phthalates			
Di-n-butyl Phthalate	6.2 GT	--	--
Polynuclear Aromatics			
Naphthalene			
2-Methylnaphthalene	--	--	0.43
Fluorene	--	--	0.22
Phenanthrene	--	--	1.5
Fluoranthrene	--	--	1.3
Pyrene	--	--	1.8
Benzo (a) Anthracene	--	--	1.1
Chrysene	--	--	1.1
Benzo (k) Fluoranthene	--	--	0.74
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-10
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-10A DX100100 UA02139 STSW 0 18-Aug-93	SSW-93-10A WX1001X1 UA02147 STSW 0 18-Aug-93	SSD-93-10B DX100200 UA02119 STSW 0 19-Aug-93
Water Quality Parameters			
pH	NA	6.14	NA
Conductivity (ms/cm)	NA	0.031	NA
Turbidity (NTU)	NA	33	NA
Dissolved Oxygen (mg/L)	NA	7.6	NA
Temperature (C)	NA	24.1	NA
Salinity (ppt)	NA	NA	NA
Total Suspended Solids (ug/L)	NA	12000	NA
Hardness (ug/L)	NA	14000	NA
Alkalinity (ug/L)	NA	7900	NA
Nitrate/Nitrite (ug/L)	NA	640	NA
Total Phosphorus (ug/L)	NA	76.3	NA
Total Kjedahl Nitrogen (ug/L)	NA	242	NA
Anions (ug/L)			
Chloride	NA	2760	NA
Sulfate	NA	4070	NA

Notes:
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SSD = Sediment
SSW = Surface Water

TABLE 3-11
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-11A DX110100 UA02171 STSW 0 20-Aug-93	SSD-93-11B DX110200 UA02172 STSW 0 20-Aug-93
Total Organic Carbon (ug/g)	62000	100000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	28	480
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	6070	8020
Arsenic	--	2.85
Barium	19.7	24.6
Calcium	503	1020
Chromium	12.5	16.2
Cobalt	3.57	5.86
Copper	10.3	15.8
Iron	9980	18400
Lead	14	28
Magnesium	2020	2980
Manganese	142	288
Nickel	9.85	15.1
Potassium	657	799
Sodium	56.2	83.7
Vanadium	13.1	15.3
Zinc	34.4	71.9
Volatile Organic Compounds (ug/g Soil, ug/L Water)		
Aromatics		
Toluene	0.14	0.2
Halogenated Organics		
1,2-Dichloroethane	0.52	--
1,1,1-Trichloroethane	--	0.22
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phthalates		
Di-n-butyl Phthalate	3	2.2
Bis (2-Ethyl hexyl) Phthalate	--	1.7

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-11
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-11A	SSD-93-11B
Field Sample ID	DX110100	DX110200
Lab Sample ID	UA02171	UA02172
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	20-Aug-93	20-Aug-93
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Polynuclear Aromatics		
Naphthalene		
2-Methylnaphthalene	1.4	0.97
Phenanthrene	1.1	0.99
Fluoranthrene	0.16	--
Pyrene	0.17	--
Chrysene	0.41	--
Pesticides/PCBs (ug/g Soil, ug/L Water)		
Endosulfan I	0.003	0.01
Endosulfan II	0.006	0.005
Dieldrin	0.008	0.028
Endrin Aldehyde	NA	NA
Heptachlor Epoxide	--	0.003
p,p'-DDD	0.054	0.8
p,p'-DDE	0.017	0.047
p,p'-DDT	0.094	0.44
Water Quality Parameters	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjeldahl Nitrogen (ug/L)	NA	NA
Anions (ug/L)	NA	NA

Notes:
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GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-12
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-12A	SSD-93-12B	SSD-93-12C	SSD-93-12D
Field Sample ID	DX120100	DX120200	DX120300	DX1204X1
Lab Sample ID	UA02117	UA02120	UA02121	UA02123
Site Type	STSW	STSW	STSW	STSW
Sample Depth (ft)	0	0	0	0
QC Type				
Collection Date:	19-Aug-93	19-Aug-93	19-Aug-93	19-Aug-93
Total Organic Carbon (ug/g)	47000	65000	79000	22000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	280	2600	7600	470
Inorganic Compounds (ug/g Soil, ug/L Water)				
Aluminum	1170	7340	3580	5470
Arsenic	14.1	7.51	5.24	9.41
Barium	--	30	16.4	23.3
Calcium	136	1060	1060	2890
Chromium	3.76	16.3	15.4	13.7
Cobalt	--	4.31	5.87	4.7
Copper	3.81	10.3	12	11.1
Iron	2510	13300	8650	13100
Lead	73	27	33	13
Magnesium	492	2820	1610	2330
Manganese	36.6	123	86.3	149
Nickel	--	8.77	6.21	9.77
Potassium	--	2510	762	1150
Sodium	--	97.5	--	100
Vanadium	2.45	17.4	9.13	12.8
Zinc	13.8	58.2	42.4	43.6
Volatile Organic Compounds (ug/g Soil, ug/L Water)				
Aromatics				
Toluene	--	--	1.3	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Phthalates				
Di-n-butyl Phthalate	--	5	--	--
Polynuclear Aromatics				
2-Methylnaphthalene	--	0.2	0.16	--
Acenaphthylene	0.6	0.26	0.37	0.26
Phenanthrene	1	0.71	0.63	0.67
Fluoranthrene	2	0.58	0.6	0.63
Pyrene	3	0.83	--	1
Benzo (a) Anthracene	1	--	--	0.46
Chrysene	2	--	--	0.62
Benzo (k) Fluoranthene	2	--	--	0.49
Benzo (ghi) Perylene	--	0.48	--	--
Pesticides/PCBs (ug/g Soil, ug/L Water)				
Endosulfan I	0.002	--	--	--
Dieldrin	0.017	0.004	0.007	0.003
Endrin Aldehyde	NA	NA	NA	NA
p,p'-DDD	0.26	0.45	0.46	0.028
p,p'-DDE	0.017	0.034	0.028	0.014
p,p'-DDT	0.77	0.55	0.15	0.025

Notes:
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SSD = Sediment
SSW = Surface Water

TABLE 3-12
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-12A DX120100 UA02117 STSW 0 19-Aug-93	SSD-93-12B DX120200 UA02120 STSW 0 19-Aug-93	SSD-93-12C DX120300 UA02121 STSW 0 19-Aug-93	SSD-93-12D DX1204X1 UA02123 STSW 0 19-Aug-93
Water Quality Parameters	NA	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA	NA
Hardness (ug/L)	NA	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA	NA
Total Kjeldhal Nitrogen (ug/L)	NA	NA	NA	NA
Anions (ug/L)	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater tham detection limit
SSD = Sediment
SSW = Surface Water

Table 3-13: System 13 Analytes

No existing data for System 13.

TABLE 3-14
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-14A	SSW-93-14A	SSD-93-14B	SSW-93-14B
Field Sample ID	DX140100	WX1401X1	DX140200	WX1402X1
Lab Sample ID	UA02125	UA02126	UA02173	UA02164
Site Type	STSW	STSW	STSW	STSW
Sample Depth (ft)	0	0	0	0
QC Type				
Collection Date:	19-Aug-93	19-Aug-93	20-Aug-93	20-Aug-93
Total Organic Carbon (ug/g)	45000	NA	52000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	110	390	730	--
Inorganic Compounds (ug/g Soil, ug/L Water)				
Aluminum	19700	20400	5380	349
Arsenic	9.51	34.8	--	--
Barium	71.4	106	18.9	5.61
Beryllium	0.822	--	--	--
Cadmium	--	--	--	--
Calcium	2340	6240	1250	2890
Chromium	43.7	54.1	13.8	--
Cobalt	14.1	--	--	--
Copper	41	62.5	4.91	--
Iron	27200	32200	9410	607
Lead	52	122	20	--
Magnesium	5340	6380	2860	343
Manganese	567	844	88.4	60.3
Nickel	31.2	--	10.9	--
Potassium	2720	4480	971	1400
Sodium	239	13200	102	1620
Vanadium	44.2	52.8	16	--
Zinc	181	365	38.2	24.1
Volatile Organic Compounds (ug/g Soil, ug/L Water)				
Aromatics				
Benzene	--	--	0.14	--
Toluene	--	--	0.52	--
Chlorinated Aromatics				
Chlorobenzene	--	--	0.16	--
Dichlorobenzene, nonspecific	--	--	0.31	--
1,1,1-Trichloroethane	--	--	--	--
Phthalates				
Di-n-butyl Phthalate	3.3	--	2.6	--

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-14
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-14A	SSW-93-14A	SSD-93-14B	SSW-93-14B
Field Sample ID	DX140100	WX1401X1	DX140200	WX1402X1
Lab Sample ID	UA02125	UA02126	UA02173	UA02164
Site Type	STSW	STSW	STSW	STSW
Sample Depth (ft)	0	0	0	0
QC Type				
Collection Date:	19-Aug-93	19-Aug-93	20-Aug-93	20-Aug-93
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Polynuclear Aromatics				
2-Methylnaphthalene	--	--	--	--
Acenaphthylene	0.21	--	--	--
Acenaphthene	--	--	0.12	--
Fluorene	--	--	0.17	--
Phenanthrene	0.58	--	2	--
Anthracene	--	--	--	--
Fluoranthrene	0.59	--	1.2	--
Pyrene	1.1	--	1.8	--
Benzo (a) Anthracene	0.45	--	0.79	--
Chrysene	0.66	--	0.69	--
Benzo (b) Fluoranthene	--	--	--	--
Benzo (k) Fluoranthene	0.57	--	--	--
Benzo (a) Pyrene	--	--	--	--
Dibenzo (a,h) Anthracene	--	--	--	--
Benzo (ghi) Perylene	--	--	0.56	--
Pesticides/PCBs (ug/g Soil, ug/L Water)				
alpha-BHC	--	--	--	0.007
Endosulfan I	0.002	0.006	--	0.005
Aldrin	--	--	--	--
beta-BHC	--	0.016	--	0.016
Endosulfan II	--	--	0.001	--
Chlordane	--	--	--	--
delta-BHC	--	0.007	--	--
Dieldrin	0.014	0.064	0.005	0.041
Endrin	--	--	--	0.02
Endrin Aldehyde	NA	--	NA	--
Endrin Ketone	--	--	--	--
Endosulfan Sulfate	--	--	--	--
Heptachlor	--	0.004	--	0.007
Heptachlor Epoxide	--	--	--	--
Isodrin	--	--	--	--
Lindane	--	--	--	0.006
Methoxychlor	--	--	--	--
PCB 1016	--	--	--	--
PCB 1221	--	--	--	--
PCB 1232	--	--	--	--
PCB 1242	--	--	--	--
PCB 1248	--	--	--	--
PCB 1254	--	--	--	--
PCB 1260	--	--	--	--
p,p'-DDD	0.27	0.206	0.017	--
p,p'-DDE	0.055	0.091	0.009	0.006
p,p'-DDT	0.68	0.25 GT	0.043	0.006
Toxaphene	--	--	--	--

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-14
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-14A DX140100 UA02125 STSW 0 19-Aug-93	SSW-93-14A WX1401X1 UA02126 STSW 0 19-Aug-93	SSD-93-14B DX140200 UA02173 STSW 0 20-Aug-93	SSW-93-14B WX1402X1 UA02164 STSW 0 20-Aug-93
Water Quality Parameters				
pH	NA	6.36	NA	5.6
Conductivity (ms/cm)	NA	0.068	NA	0.023
Turbidity (NTU)	NA	5	NA	15
Dissolved Oxygen (mg/L)	NA	8.63	NA	1.14
Temperature (C)	NA	23.6	NA	21
Salinity (ppt)	NA	NA	NA	NA
Total Suspended Solids (ug/L)	NA	540000	NA	--
Hardness (ug/L)	NA	40000	NA	8500
Alkalinity (ug/L)	NA	8200	NA	6100
Nitrate/Nitrite (ug/L)	NA	220	NA	186
Total Phosphorus (ug/L)	NA	220	NA	54.9
Total Kjeldhal Nitrogen (ug/L)	NA	189	NA	324
Anions (ug/L)				
Chloride	NA	13000	NA	1040
Sulfate	NA	4010	NA	4370

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-14
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-14C	SSD-93-14D
Field Sample ID	DX140300	DX140400
Lab Sample ID	UA02169	UA02633
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		.
Collection Date:	20-Aug-93	03-Sep-93
Total Organic Carbon (ug/g)	50000	13000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	850	80
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	12700	8140
Arsenic	3.4	5.73
Barium	45.8	16.8
Beryllium	0.519	--
Cadmium	1.6	--
Calcium	1690	1590
Chromium	27.7	23.4
Cobalt	9.81	3.52
Copper	30.6	6.56
Iron	22700	15500
Lead	45	6.64
Magnesium	5000	5080
Manganese	295	207
Nickel	27.6	15.6
Potassium	2380	1250
Sodium	117	70.9
Vanadium	30.6	12.5
Zinc	144	39.8
Volatile Organic Compounds (ug/g Soil, ug/L Water)		
Aromatics		
Benzene	--	--
Toluene	--	--
Chlorinated Aromatics		
Chlorobenzene	--	--
Dichlorobenzene, nonspecific	--	--
1,1,1-Trichloroethane	0.24	--
Phthalates		
Di-n-butyl Phthalate	6.1	

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-14
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-14C	SSD-93-14D
Field Sample ID	DX140300	DX140400
Lab Sample ID	UA02169	UA02633
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	20-Aug-93	03-Sep-93
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Polynuclear Aromatics		
2-Methylnaphthalene	0.82	--
Acenaphthylene	4.6	0.48
Acenaphthene	0.24	--
Fluorene	1	0.28
Phenanthrene	6.9	3.4
Anthracene	5.4	--
Fluoranthrene	7.1	2.6
Pyrene	5.7	3.3
Benzo (a) Anthracene	4.5	1.7
Chrysene	5.4	2
Benzo (b) Fluoranthene	4.7	1.8
Benzo (k) Fluoranthene	3.6	1.8
Benzo (a) Pyrene	4.5	--
Dibenzo (a,h) Anthracene	1	--
Benzo (ghi) Perylene	--	1.1
Pesticides/PCBs (ug/g Soil, ug/L Water)		
alpha-BHC	--	NA
Endosulfan I	0.003	NA
Aldrin	--	NA
beta-BHC	--	NA
Endosulfan II	0.005	NA
Chlordane	--	NA
delta-BHC	--	NA
Dieldrin	0.042	NA
Endrin	--	NA
Endrin Aldehyde	NA	NA
Endrin Ketone	--	NA
Endosulfan Sulfate	--	NA
Heptachlor	--	NA
Heptachlor Epoxide	--	NA
Isodrin	--	NA
Lindane	--	NA
Methoxychlor	--	NA
PCB 1016	--	NA
PCB 1221	--	NA
PCB 1232	--	NA
PCB 1242	--	NA
PCB 1248	--	NA
PCB 1254	--	NA
PCB 1260	--	NA
p,p'-DDD	0.026	NA
p,p'-DDE	0.008	NA
p,p'-DDT	0.1 GT	NA
Toxaphene	--	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-14
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-14C DX140300 UA02169 STSW 0 20-Aug-93	SSD-93-14D DX140400 UA02633 STSW 0 03-Sep-93
Water Quality Parameters		
pH	NA	NA
Conductivity (ms/cm)	NA	NA
Turbidity (NTU)	NA	NA
Dissolved Oxygen (mg/L)	NA	NA
Temperature (C)	NA	NA
Salinity (ppt)	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjeldhal Nitrogen (ug/L)	NA	NA
Anions (ug/L)		
Chloride	NA	NA
Sulfate	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-15
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-15A DX150100 UA02180 STSW 0 23-Aug-93
Total Organic Carbon (ug/g)	62000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	390
Inorganic Compounds (ug/g Soil, ug/L Water)	NA
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phthalates	
Di-n-butyl Phthalate	6.2 GT
Polynuclear Aromatics	
2-Methylnaphthalene	0.23
Acenaphthylene	1.5
Acenaphthene	0.12
Fluorene	0.35
Phenanthrene	4.8
Fluoranthrene	4.8
Pyrene	7.2
Benzo (a) Anthracene	4.2
Chrysene	4.6
Benzo (b) Fluoranthene	4.4
Benzo (k) Fluoranthene	4.1
Benzo (a) Pyrene	4.2
Dibenzo (a,h) Anthracene	0.54
Benzo (ghi) Perylene	3.4
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-16
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-16A	SSD-93-16B
Field Sample ID	DX160100	DX160200
Lab Sample ID	UA02179	UA02509
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	23-Aug-93	31-Aug-93
Total Organic Carbon (ug/g)	72000	12000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	790	220
Inorganic Compounds (ug/g Soil, ug/L Water)	NA	NA
Volatile Organic Compounds (ug/g Soil, ug/L Water)		
Halogenated Organics		
Bromoform	--	0.25
1,1,2,2-Tetrachloroethane	--	0.52
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phthalates		
Di-n-butyl Phthalate	3.8	4.4
Bis (2-Ethyl hexyl) Phthalate	6.2 GT	--
Polynuclear Aromatics		
Acenaphthylene	--	0.12
Phenanthrene	0.12	0.55
Fluoranthrene	--	0.64
Pyrene	--	0.74
Benzo (a) Anthracene	--	0.39
Chrysene	--	0.5
Benzo (k) Fluoranthene	--	0.41
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA
Water Quality Parameters	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjeldahl Nitrogen (ug/L)	NA	NA
Anions (ug/L)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-17
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-17A	SSD-93-17B
Field Sample ID	DX170100	DX170200
Lab Sample ID	UA02183	UA02182
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	23-Aug-93	23-Aug-93
Total Organic Carbon (ug/g)	58000	42000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	1500	360
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	10900	11000
Arsenic	9.18	4.99
Barium	38.7	23.9
Beryllium	0.687	0.535
Calcium	2330	1510
Chromium	26.6	31.2
Cobalt	7.87	7.65
Copper	21.5	15.9
Iron	22600	22900
Lead	37	33
Magnesium	4530	6150
Manganese	199	287
Nickel	17	24
Potassium	2360	1270
Sodium	313	144
Vanadium	23.6	20.1
Zinc	67.5	67.7
Volatile Organic Compounds (ug/g Soil, ug/L Water)		
Phthalates		
Di-n-butyl Phthalate	3.9	3.8
Bis (2-Ethyl hexyl) Phthalate	1.7	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Polynuclear Aromatics		
Acenaphthylene	0.072	--
Phenanthrene	0.15	--
Fluoranthrene	0.17	0.086
Pyrene	0.27	--
Benzo (a) Anthracene	0.15	--
Chrysene	0.32	--
Pesticides/PCBs (ug/g Soil, ug/L Water)		
Dieldrin	--	0.003
Endrin Aldehyde	NA	NA
Endosulfan Sulfate	0.107	0.02
p,p'-DDD	--	0.005
p,p'-DDT	0.008	0.017

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-17
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-17A DX170100 UA02183 STSW 0 23-Aug-93	SSD-93-17B DX170200 UA02182 STSW 0 23-Aug-93
Water Quality Parameters	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjeldahl Nitrogen (ug/L)	NA	NA
Anions (ug/L)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-18
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-18A DX180100 UA02181 STSW 0 23-Aug-93	SSD-93-18B DX180200 UA02184 STSW 0 23-Aug-93	SSD-93-18C DX180300 UA02187 STSW 0 23-Aug-93
Total Organic Carbon (ug/g)	20000	92000	19000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	350	480	500
Inorganic Compounds (ug/g Soil, ug/L Water)	NA	NA	NA
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	4.3	8	4.2
Bis (2-Ethyl hexyl) Phthalate	1	1.8	--
Polynuclear Aromatics			
Phenanthrene	--	0.11	--
Fluoranthrene	0.1	--	--
Pyrene	0.21	--	--
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA
Water Quality Parameters	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjeldahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-19
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-19A	SSD-93-19B
Field Sample ID	DX190100	DX190200
Lab Sample ID	UA02185	UA02186
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	23-Aug-93	23-Aug-93
Total Organic Carbon (ug/g)	22000	18000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	350	310
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	6580	6570
Arsenic	3.75	15
Barium	25.8	34.5
Beryllium	--	0.663
Calcium	1480	1700
Chromium	18.3	24.4
Cobalt	3.37	8.55
Copper	8.58	55.1
Iron	12500	15600
Lead	47	75
Magnesium	3040	3440
Manganese	90.7	151
Nickel	12.8	35.1
Potassium	885	846
Sodium	146	120
Vanadium	12.7	12
Zinc	62.1	189
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phthalates		
Di-n-butyl Phthalate	6.2 GT	2.3
Polynuclear Aromatics		
Acenaphthylene	0.22	--
Phenanthrene	0.73	--
Fluoranthrene	1.2	--
Pyrene	1.6	--
Benzo (a) Anthracene	0.79	--
Chrysene	0.92	--
Benzo (b) Fluoranthene	1.1	--
Benzo (k) Fluoranthene	0.92	--
Pesticides/PCBs (ug/g Soil, ug/L Water)		
Endrin Aldehyde	NA	NA
Endosulfan Sulfate	0.005	0.017
p,p'-DDD	--	0.003
p,p'-DDT	--	0.009

Notes:
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NA = Not Analyzed
GT = Greater than detection lmimt
SSD = Sediment
SSW = Surface Water

TABLE 3-19
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-19A DX190100 UA02185 STSW 0 23-Aug-93	SSD-93-19B DX190200 UA02186 STSW 0 23-Aug-93
Water Quality Parameters	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjeldahl Nitrogen (ug/L)	NA	NA
Anions (ug/L)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection lmimt
SSD = Sediment
SSW = Surface Water

TABLE 3-20
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-20A DX200100 UA02190 STSW 0 23-Aug-93	SSD-93-20B DX200200 UA02174 STSW 0 20-Aug-93	SSD-93-20C DX200300 UA02232 STSW 0 24-Aug-93
Total Organic Carbon (ug/g)	26000	NA	55000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	4700	910	1200
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	8060	4060	9010
Arsenic	11.8	--	9.52
Barium	21.2	27.6	28.3
Cadmium	--	--	3.56
Calcium	1490	2620	2070
Chromium	21.4	14.4	23.7
Cobalt	4.86	--	6.52
Copper	20.4	12.3	24.1
Iron	16600	10100	18100
Lead	110	32	59
Magnesium	4010	1490	4140
Manganese	200	300	191
Nickel	18.9	7.51	22.6
Potassium	836	990	1690
Selenium	--	--	1.75
Sodium	74.2	89.8	141
Vanadium	14	12.2	22.3
Zinc	79.2	88	109
Volatile Organic Compounds (ug/g Soil, ug/L Water)			
Water Solubles			
Acetone	--	4.5	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	2.6	7.7	1.8
Bis (2-Ethyl hexyl) Phthalate	--	--	6.2 GT
Polynuclear Aromatics			
Phenanthrene	--	--	0.25
Pyrene	1.2	--	--
Pesticides/PCBs (ug/g Soil, ug/L Water)			
Dieldrin	NA	0.009	NA
Endrin Ketone	NA	0.002	NA
p,p'-DDT	NA	0.007	NA

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-20
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-20A DX200100 UA02190 STSW 0 23-Aug-93	SSD-93-20B DX200200 UA02174 STSW 0 20-Aug-93	SSD-93-20C DX200300 UA02232 STSW 0 24-Aug-93
Water Quality Parameters	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-21
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-21A	SSD-93-21B	SSD-93-21C	SSD-93-21D
Field Sample ID	DX210100	DX210200	DX210300	DX210400
Lab Sample ID	UA02188	UA02189	UA02191	UA02634
Site Type	STSW	STSW	STSW	STSW
Sample Depth (ft)	0	0	0	0
QC Type				
Collection Date:	23-Aug-93	23-Aug-93	23-Aug-93	03-Sep-93
Total Organic Carbon (ug/g)	18000	72000	24000	20000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	400	1100	600	340
Inorganic Compounds (ug/g Soil, ug/L Water)				
Aluminum	NA	NA	NA	5270
Arsenic	NA	NA	NA	4.5
Barium	NA	NA	NA	490
Boron	NA	NA	NA	14.4
Calcium	NA	NA	NA	1330
Chromium	NA	NA	NA	13.1
Copper	NA	NA	NA	16.9
Iron	NA	NA	NA	13300
Lead	NA	NA	NA	8.7
Magnesium	NA	NA	NA	2160
Manganese	NA	NA	NA	139
Nickel	NA	NA	NA	6.98
Potassium	NA	NA	NA	738
Sodium	NA	NA	NA	136
Vanadium	NA	NA	NA	9.89
Zinc	NA	NA	NA	58.3
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Phenols				
Dibenzofuran	0.97	--	--	--
Phthalates				
Di-n-butyl Phthalate	7.6	4.3	2.1	--
Bis (2-Ethyl hexyl) Phthalate	--	4	--	1.1
Polynuclear Aromatics				
Acenaphthylene	0.68	0.26	--	0.27
Acenaphthene	1.7	--	--	--
Fluorene	3.3	--	--	--
Phenanthrene	12 GT	1.8	0.27	0.49
Anthracene	11	--	--	--
Fluoranthrene	6.2 GT	1.6	0.27	0.77
Pyrene	6.2 GT	1.7	0.55	1.3
Benzo (a) Anthracene	15	0.93	0.35	0.81
Chrysene	13	1.1	0.42	0.98
Benzo (b) Fluoranthene	9.8	1.2	--	0.63
Benzo (k) Fluoranthene	11	1	--	0.56
Benzo (a) Pyrene	11	--	--	--
Indeno (1,2,3,cd) Pyrene	5	--	--	--
Dibenzo (a,h) Anthracene	1.5	--	--	--
Benzo (ghi) Perylene	5.9	--	--	--
Pesticides/PCBs (ug/g Soil, ug/L Water)	--	--	--	--

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-21
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-21A DX210100 UA02188 STSW 0 23-Aug-93	SSD-93-21B DX210200 UA02189 STSW 0 23-Aug-93	SSD-93-21C DX210300 UA02191 STSW 0 23-Aug-93	SSD-93-21D DX210400 UA02634 STSW 0 03-Sep-93
Water Quality Parameters	NA	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA	NA
Hardness (ug/L)	NA	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA	NA
Anions (ug/L)	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-22
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-22A	SSW-93-22A	SSD-93-22B
Field Sample ID	DX220100	WX2201X1	DX220200
Lab Sample ID	UA02236	UA02231	UA02239
Site Type	STSW	STSW	STSW
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	24-Aug-93	24-Aug-93	24-Aug-93
Total Organic Carbon (ug/g)	49000	NA	45000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	1100	--	1300
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	4660	315	3970
Arsenic	5.9	3.2	12.1
Barium	12.5	15.2	11.4
Calcium	1580	9620	1970
Chromium	15.1	--	19.1
Copper	16.5	--	14.3
Iron	13200	1710	8020
Lead	79	10.4	20
Magnesium	2320	776	2190
Manganese	94.4	164	104
Nickel	10.4	--	7.02
Potassium	629	1510	670
Sodium	73.7	3070	60.1
Vanadium	10.2	--	10.8
Zinc	42.8	136	69.7
Volatile Organic Compounds (ug/g Soil, ug/L Water)			
Aromatics			
Toluene	1.5	--	0.8
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	2.2	--	2.9
Bis (2-Ethyl hexyl) Phthalate	1.3	--	2.8
Polynuclear Aromatics			
Phenanthrene	0.57	--	0.46
Fluoranthrene	0.58	--	0.45
Pyrene	0.82	--	0.86
Pesticides/PCBs (ug/g Soil, ug/L Water)	--	--	--

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-22
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-22A	SSW-93-22A	SSD-93-22B
Field Sample ID	DX220100	WX2201X1	DX220200
Lab Sample ID	UA02236	UA02231	UA02239
Site Type	STSW	STSW	STSW
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	24-Aug-93	24-Aug-93	24-Aug-93
Water Quality Parameters			
pH	NA	4.96	NA
Conductivity (ms/cm)	NA	0.11	NA
Turbidity (NTU)	NA	6	NA
Dissolved Oxygen (mg/L)	NA	2.36	NA
Temperature (C)	NA	21.2	NA
Salinity (ppt)	NA	0	NA
Total Suspended Solids (ug/L)	NA	22000	NA
Hardness (ug/L)	NA	27000	NA
Alkalinity (ug/L)	NA	8800	NA
Nitrate/Nitrite (ug/L)	NA	93.7	NA
Total Phosphorus (ug/L)	NA	55.3	NA
Total Kjedahl Nitrogen (ug/L)	NA	722	NA
Anions (ug/L)			
Chloride	NA	3470	NA
Sulfate	NA	15000	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-23
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-23A DX230100 UA02233 STSW 0 24-Aug-93	SSD-93-23B DX230200 UA02234 STSW 0 24-Aug-93	SSD-93-23C DX230300 UA02235 STSW 0 24-Aug-93
Total Organic Carbon (ug/g)	42000	22000	30000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	280	600	950
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	4340	4300	4400
Arsenic	7.51	6.06	6.25
Barium	13.9	10.9	21.2
Calcium	1680	2460	1490
Chromium	14	15	40.5
Cobalt	2.69	3.97	3.72
Copper	12.1	12.2	11.5
Iron	12300	11600	10800
Lead	48	25	40
Magnesium	2020	2590	2210
Manganese	114	249	153
Nickel	8.07	9.58	9.86
Potassium	552	851	656
Sodium	85.5		71.4
Tin	14.9		
Vanadium	11.3	10.7	12.3
Zinc	45.1	46.5	50.6
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	6.2 GT	3.5	1.6
Polynuclear Aromatics			
2-Methylnaphthalene	0.069		
Acenaphthylene	1.4		
Acenaphthene	0.15		
Phenanthrene	1.5	0.25	0.31
Fluoranthrene	2.7	0.3	0.34
Pyrene	6.1	0.39	0.38
Benzo (a) Anthracene	3		
Chrysene	3		
Benzo (b) Fluoranthene	1.4		
Benzo (k) Fluoranthene	1.4		
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-23
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-23A DX230100 UA02233 STSW 0 24-Aug-93	SSD-93-23B DX230200 UA02234 STSW 0 24-Aug-93	SSD-93-23C DX230300 UA02235 STSW 0 24-Aug-93
Water Quality Parameters	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-24
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-24A DX240100 UA02319 STSW 0 25-Aug-93	SSW-93-24A WX2401X1 UA02690 STSW 0 25-Aug-93	SSD-93-24B DX240200 UA02321 STSW 0 25-Aug-93	SSD-93-24C DX240300 UA02241 STSW 0 24-Aug-93
Total Organic Carbon (ug/g)	19000	NA	88000	21000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	360	750	54	20
Inorganic Compounds (ug/g Soil, ug/L Water)				
Barium	NA	13.3	NA	NA
Calcium	NA	23100	NA	NA
Iron	NA	1640	NA	NA
Magnesium	NA	5040	NA	NA
Manganese	NA	1120	NA	NA
Potassium	NA	1660	NA	NA
Sodium	NA	23200	NA	NA
Volatile Organic Compounds (ug/g Soil, ug/L Water)				
Aromatics				
Toluene	--	3.5	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Nitromonocyclic Aromatics				
2,6-Dinitrotoluene	--	NA	--	--
2,4-Dinitrotoluene	--	NA	--	--
Phthalates				
Di-n-butyl Phthalate	1.6	NA	5.6	5.6
Polynuclear Aromatics				
Phenanthrene	0.13	NA	--	--
Fluoranthrene	0.14	NA	0.69	--
Pyrene	0.2	NA	1.1	--
Pesticides/PCBs (ug/g Soil, ug/L Water)				
Dieldrin	--	0.024	--	--
Endosulfan Sulfate	0.006	--	0.003	0.002
p,p'-DDD	--	--	0.008	--
p,p'-DDE	--	0.007	0.016	--
p,p'-DDT	--	0.008	--	0.005

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-24
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-24A DX240100 UA02319 STSW 0 25-Aug-93	SSW-93-24A WX2401X1 UA02690 STSW 0 25-Aug-93	SSD-93-24B DX240200 UA02321 STSW 0 25-Aug-93	SSD-93-24C DX240300 UA02241 STSW 0 24-Aug-93
Water Quality Parameters				
pH	NA	6.48	NA	NA
Conductivity (ms/cm)	NA	0.255	NA	NA
Turbidity (NTU)	NA	60	NA	NA
Dissolved Oxygen (mg/L)	NA	3.94	NA	NA
Temperature (C)	NA	18.9	NA	NA
Salinity (ppt)	NA	0.01	NA	NA
Total Suspended Solids (ug/L)	NA	--	NA	NA
Hardness (ug/L)	NA	77000	NA	NA
Alkalinity (ug/L)	NA	96000	NA	NA
Nitrate/Nitrite (ug/L)	NA	154	NA	NA
Total Phosphorus (ug/L)	NA	13.5	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	530	NA	NA
Anions (ug/L)				
Chloride	NA	22000	NA	NA
Sulfate	NA	5120	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-25
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-25A DD250100 UA02238 STSW 0 Duplicate 24-Aug-93	SSD-93-25A DX250100 UA02237 STSW 0 24-Aug-93	SSD-93-25B DX250200 UA02240 STSW 0 24-Aug-93
Total Organic Carbon (ug/g)	NA	99000	33000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	1600	2400	270
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	12800	11200	4190
Arsenic	22.8	16.5	8.44
Barium	39.7	34.4	8.95
Calcium	3900	3160	759
Chromium	43.2	34.6	8.85
Cobalt	7.16	7.19	--
Copper	30.3	22	6.96
Iron	21700	18900	9410
Lead	210	140	28
Magnesium	4570	4390	1720
Manganese	248	283	111
Nickel	23.2	20.5	6.92
Potassium	1440	1410	430
Selenium	--	1.07	--
Sodium	195	141	59.9
Vanadium	35.5	32.2	7.43
Zinc	104	89.1	23.8
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	5.6	5.6	5.6
Polynuclear Aromatics			
2-Methylnaphthalene	0.42	0.33	--
Acenaphthylene	2.6	3.6	0.37
Acenaphthene	0.62	0.53	--
Fluorene	2.6	2.7	0.29
Phenanthrene	32	26	3.2
Anthracene	4.5	3.6	--
Fluoranthrene	6.2 GT	6.2 GT	2.6
Pyrene	6.2 GT	6.2 GT	4.1
Benzo (a) Anthracene	15	12	2.2
Chrysene	--	16	2.4
Benzo (b) Fluoranthene	22	15	2.3
Benzo (k) Fluoranthene	20	15	2.3
Benzo (a) Pyrene	15	12	--
Indeno (1,2,3,cd) Pyrene	12	7.6	--
Dibenzo (a,h) Anthracene	--	2.8	--
Benzo (ghi) Perylene	14	8.6	1.6

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-25
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-25A DD250100 UA02238 STSW 0 Duplicate 24-Aug-93	SSD-93-25A DX250100 UA02237 STSW 0 24-Aug-93	SSD-93-25B DX250200 UA02240 STSW 0 24-Aug-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA
Water Quality Parameters	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)	NA	NA	NA

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-26
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-26A	SSD-93-26B
Field Sample ID	DX260100	DX260200
Lab Sample ID	UA02397	UA02407
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	26-Aug-93	27-Aug-93
Total Organic Carbon (ug/g)	15000	43000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	33	820
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	7090	7920
Arsenic	20.2	3.91
Barium	16.3	20.2
Calcium	892	1380
Chromium	23.2	21.5
Cobalt	4.43	–
Copper	12.1	15.4
Iron	17600	14200
Lead	13	16
Magnesium	3610	4310
Manganese	264	163
Nickel	16.7	14.9
Potassium	438	1040
Sodium	48.1	77.9
Vanadium	11.1	14.3
Zinc	83.6	61.2
Volatile Organic Compounds (ug/g Soil, ug/L Water)	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phthalates		
Di-n-butyl Phthalate	5.6	5.6
Polynuclear Aromatics		
2-Methylnaphthalene	0.18	0.14
Acenaphthylene	1.2	2.4
Acenaphthene	0.22	0.092
Fluorene	1.2	–
Phenanthrene	12 GT	5.8
Anthracene	2.9	–
Fluoranthrene	6.2 GT	4.2
Pyrene	6.2 GT	5.1
Benzo (a) Anthracene	7.3	3.3
Chrysene	6.6	3.1
Benzo (b) Fluoranthene	7.5	2.7
Benzo (k) Fluoranthene	5	3
Benzo (a) Pyrene	4.5	–
Benzo (ghi) Perylene	3.5	1.9
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA

Notes:
– = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-26
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-26A DX260100 UA02397 STSW 0 26-Aug-93	SSD-93-26B DX260200 UA02407 STSW 0 27-Aug-93
Water Quality Parameters	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA
Anions (ug/L)	NA	NA

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-27
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-27A DX270100 UA02242 STSW 0 24-Aug-93	SSD-93-27B DX270200 UA02243 STSW 0 24-Aug-93
Total Organic Carbon (ug/g)	23000	24000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	23	300
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	6830	5590
Arsenic	8.64	4.06
Barium	16.5	11.5
Calcium	290	759
Chromium	8.35	12.6
Cobalt	--	3.53
Copper	10.5	8.07
Iron	8100	11900
Lead	8.3	30
Magnesium	1370	2440
Manganese	72.1	141
Nickel	6.55	9.65
Potassium	356	541
Vanadium	8.16	11
Zinc	21.3	54.2
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phthalates		
Di-n-butyl Phthalate	5.6	5.6
Polynuclear Aromatics		
Acenaphthylene	--	0.38
Phenanthrene	--	1.2
Fluoranthrene	--	1.9
Pyrene	--	3.4
Benzo (a) Anthracene	--	1.8
Chrysene	--	1.9
Benzo (b) Fluoranthene	--	2
Benzo (k) Fluoranthene	--	2.2
Benzo (ghi) Perylene	--	1.4
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA

Notes:
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NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-27
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-27A DX270100 UA02242 STSW 0 24-Aug-93	SSD-93-27B DX270200 UA02243 STSW 0 24-Aug-93
Water Quality Parameters	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA
Anions (ug/L)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-28
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-28A DX280100 UA02322 STSW 0 25-Aug-93	SSD-93-28B DX280200 UA02323 STSW 0 25-Aug-93	SSD-93-28C DX280300 UA02328 STSW 0 25-Aug-93	SSD-93-28D DX280400 UA02390 STSW 0 26-Aug-93
Total Organic Carbon (ug/g)	21000	18000	25000	61000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	110	270	370	290
Inorganic Compounds (ug/g Soil, ug/L Water)				
Aluminum	7090	5650	7120	6550
Arsenic	15	6.07	7.14	4.65
Barium	15.8	12.8	15.9	15.4
Cadmium	1.73	--	--	--
Calcium	993	878	3620	1000
Chromium	20.2	17	24.3	18.1
Cobalt	5.57	3.95	4.7	4.18
Copper	13.3	15.7	65	11.9
Iron	15100	11500	39600	13600
Lead	23	22	34	34
Magnesium	4270	3280	3780	3460
Manganese	239	156	296	127
Nickel	19.7	15.2	15	14.7
Potassium	635	706	761	720
Sodium	51.5	46.3	--	--
Vanadium	13.5	12.9	16.4	11.8
Zinc	47	38	62.1	66.5
Volatile Organic Compounds (ug/g Soil, ug/L Water)				
Aromatics				
Toluene	--	--	--	0.64
Chlorinated Aromatics				
Chlorobenzene	--	--	0.13	--
Halogenated Organics				
1,3-Dichloropropane	--	--	--	0.48
Tetrachloroethene	--	--	--	0.54
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Phthalates				
Di-n-butyl Phthalate	5.6	5.6	5.6	5.6
Polynuclear Aromatics				
Phenanthrene	0.13	--	--	0.4
Fluoranthrene	0.082	0.14	0.13	0.5
Pyrene	--	0.2	0.15	0.46
Benzo (a) Anthracene	--	--	0.24	0.33
Chrysene	--	--	0.31	0.31
Benzo (k) Fluoranthene	--	--	--	0.34
Pesticides/PCBs (ug/g Soil, ug/L Water)				
Dieldrin	--	0.004	--	0.003
Endosulfan Sulfate	0.011	0.016	0.008	0.047
p,p'-DDD	0.014	0.027	--	0.092
p,p'-DDE	0.011	0.011	--	0.028
p,p'-DDT	0.042	0.09	0.004	0.075

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-28
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-28A DX280100 UA02322 STSW 0 25-Aug-93	SSD-93-28B DX280200 UA02323 STSW 0 25-Aug-93	SSD-93-28C DX280300 UA02328 STSW 0 25-Aug-93	SSD-93-28D DX280400 UA02390 STSW 0 26-Aug-93
Water Quality Parameters	NA	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA	NA
Hardness (ug/L)	NA	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA	NA
Anions (ug/L)	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-29
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-29A	SSD-93-29B	SSD-93-29C
Field Sample ID	DX290100	DX290200	DX290300
Lab Sample ID	UA02317	UA02318	UA02320
Site Type	STSW	STSW	STSW
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	25-Aug-93	25-Aug-93	25-Aug-93
Total Organic Carbon (ug/g)	72000	51000	59000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	330	450	1200
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	10000	4910	28000
Arsenic	7.35	5.87	21
Barium	20.8	13.4	92.1
Calcium	1760	1090	23000
Chromium	31.5	12.8	35.8
Cobalt	6.13	--	8.15
Copper	12.2	7.92	84.8
Iron	20500	10500	24200
Lead	96	68	100
Magnesium	5800	2230	4370
Manganese	301	118	258
Nickel	22.3	8.54	22.4
Potassium	708	550	1610
Sodium	61.8	59.3	221
Vanadium	21.8	10.7	29.8
Zinc	90.4	52.8	204
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	5.6	5.6	5.6
Polynuclear Aromatics			
2-Methylnaphthalene	0.17	0.11	--
Acenaphthylene	0.74	0.8	--
Fluorene	0.16	0.29	--
Phenanthrene	2.9	4.2	--
Fluoranthrene	3.1	4.4	0.82
Pyrene	3.4	5.2	1.2
Benzo (a) Anthracene	2	2.8	--
Chrysene	1.9	3	--
Benzo (b) Fluoranthene	2.2	2.2	--
Benzo (k) Fluoranthene	2.2	2.7	--
Dibenzo (a,h) Anthracene	0.43	--	--
Benzo (ghi) Perylene	2.3	1.9	--
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-29
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-29A DX290100 UA02317 STSW 0 25-Aug-93	SSD-93-29B DX290200 UA02318 STSW 0 25-Aug-93	SSD-93-29C DX290300 UA02320 STSW 0 25-Aug-93
Water Quality Parameters	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-30
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-30A	SSW-93-30A	SSD-93-30B
Field Sample ID	DX300100	WX3001X1	DX300200
Lab Sample ID	UA02398	UA02410	UA02399
Site Type	STSW	STSW	STSW
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	26-Aug-93	27-Aug-93	26-Aug-93
Total Organic Carbon (ug/g)	51000	NA	28000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	200	--	510
Inorganic Compounds (ug/g Soil, ug/L Water)	NA	NA	NA
Volatile Organic Compounds (ug/g Soil, ug/L Water)			
Water Solubles			
Acetone	--	100 GT	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	7.6	--	3.4
Polynuclear Aromatics			
Phenanthrene	--	--	1.1
Fluoranthrene	0.13	--	1.8
Pyrene	--	--	2.4
Benzo (a) Anthracene	--	--	1.8
Benzo (b) Fluoranthene	--	--	1.8
Benzo (k) Fluoranthene	--	--	1.4
Pesticides/PCB's (ug/g Soil, ug/L Water)	NA	NA	NA
Water Quality Parameters			
pH	NA	6.26	NA
Conductivity (ms/cm)	NA	0.21	NA
Turbidity (NTU)	NA	10	NA
Dissolved Oxygen (mg/L)	NA	8.57	NA
Temperature (C)	NA	23.5	NA
Salinity (ppt)	NA	0	NA
Total Suspended Solids (ug/L)	NA	36000	NA
Hardness (ug/L)	NA	79000	NA
Alkalinity (ug/L)	NA	39000	NA
Nitrate/Nitrite (ug/L)	NA	240	NA
Total Phosphorus (ug/L)	NA	40.4	NA
Total Kjedahl Nitrogen (ug/L)	NA	64 LT	NA
Anions (ug/L)			
Chloride	NA	55000	NA
Sulfate	NA	13000	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-31
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-31A DX310100 UA02391 STSW 0 26-Aug-93	SSD-93-31B DX310200 UA02392 STSW 0 26-Aug-93	SSD-93-31C DX310300 UA02393 STSW 0 26-Aug-93
Total Organic Carbon (ug/g)	15000	28000	46000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	--	760	2100
Inorganic Compounds (ug/g Soil, ug/L Water)	NA	NA	NA
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	3.3	3.6	1.9
Bis (2-Ethyl hexyl) Phthalate	--	6.2 GT	6.2 GT
Polynuclear Aromatics			
Phenanthrene	--	--	0.43
Fluoranthrene	--	--	0.55
Pyrene	--	--	0.57
Benzo (a) Anthracene	--	--	0.38
Chrysene	--	--	0.42
Pesticides/PCB's (ug/g Soil, ug/L Water)	NA	NA	NA
Water Quality Parameters	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-32
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-32A	SSW-93-32A
Field Sample ID	DX320100	WX3201X1
Lab Sample ID	UA02408	UA02413
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	27-Aug-93	27-Aug-93
Total Organic Carbon (ug/g)	36000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	360	--
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	4360	248
Arsenic	3.38	--
Barium	16	--
Calcium	736	619
Chromium	10.9	--
Copper	30.2	31.2
Iron	10800	172
Lead	37	11
Magnesium	1730	--
Manganese	81.8	--
Nickel	5.88	--
Potassium	886	--
Sodium	74.1	--
Vanadium	17.9	--
Zinc	79	324
Volatile Organic Compounds (ug/g Soil, ug/L Water)		
Halogenated Organics		
1,1,1-Trichloroethane	0.25	--
Phthalates		
Di-n-butyl Phthalate	6.2 GT	--
Polynuclear Aromatics		
Acenaphthylene	0.51	--
Phenanthrene	0.45	--
Fluoranthrene	0.77	--
Pyrene	1.2	--
Benzo (a) Anthracene	0.89	--
Chrysene	0.88	--
Benzo (b) Fluoranthene	1.1	--
Benzo (k) Fluoranthene	0.87	--
Pesticides/PCB's (ug/g Soil, ug/L Water)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-32
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-32A	SSW-93-32A
Field Sample ID	DX320100	WX3201X1
Lab Sample ID	UA02408	UA02413
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type		
Collection Date:	27-Aug-93	27-Aug-93
Water Quality Parameters		
pH	NA	7.1
Conductivity (ms/cm)	NA	0.008
Turbidity (NTU)	NA	-10
Dissolved Oxygen (mg/L)	NA	6.18
Temperature (C)	NA	22.1
Salinity (ppt)	NA	0
Total Suspended Solids (ug/L)	NA	--
Hardness (ug/L)	NA	1500
Alkalinity (ug/L)	NA	--
Nitrate/Nitrite (ug/L)	NA	250
Total Phosphorus (ug/L)	NA	18.1
Total Kjedahl Nitrogen (ug/L)	NA	544
Anions (ug/L)		
Chloride	NA	278
Sulfate	NA	2320

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-33
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-33A DX330100 UA02326 STSW 0 25-Aug-93	SSD-93-33B DX330200 UA02325 STSW 0 25-Aug-93	SSD-93-33C DX330300 UA02324 STSW 0 25-Aug-93	SSW-93-33C WX3303X1 UA02314 STSW 0 25-Aug-93	SSD-93-33D DX330400 UA02327 STSW 0 25-Aug-93
Total Organic Carbon (ug/g)	54000	23000	13000	NA	71000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	230	220	50	--	1900
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	10800	7310	5960	--	25400
Arsenic	16.5	11	14	2.61	67
Barium	34.6	27.7	16.9	10.5	117
Calcium	2420	6330	1740	34400	4100
Chromium	40	20.3	15.4	--	67.7
Cobalt	5.72	5.08	4	--	22
Copper	14.5	7.87	10	--	57.2
Iron	21600	15900	13400	311	75800
Lead	43	23	15	--	230
Magnesium	5150	3730	3240	4490	8990
Manganese	1090	687	429	371	1760
Nickel	22.8	14.6	13.3	--	47.9
Potassium	781	625	628	2690	3480
Sodium	--	89.5	--	19400	285
Vanadium	18.2	12.9	9.54	--	51.2
Zinc	105	49.4	105	--	327
Volatile Organic Compounds (ug/g Soil, ug/L Water)					
Halogenated Organics					
1,2-Dichloroethane	1.1	0.98	--	--	2.3
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phthalates					
Di-n-butyl Phthalate	2.2	3.4	3.7	--	4.3
Polynuclear Aromatics					
Acenaphthylene	0.097	--	--	--	--
Pherianthrene	0.11	--	--	--	--
Fluoranthrene	0.14	0.08	--	--	--
Pyrene	0.22	--	--	--	--
Pesticides/PCB's (ug/g Soil, ug/L Water)					
Endosulfan Sulfate	0.028	0.006	0.004	--	0.083
p,p'-DDD	0.014	0.007	0.005	--	0.021
p,p'-DDE	0.016	0.006	0.004	--	0.014
p,p'-DDT	0.051	0.012	0.005	--	0.018
Water Quality Parameters					
pH	NA	NA	NA	7.1	NA
Conductivity (ms/cm)	NA	NA	NA	0.27	NA
Turbidity (NTU)	NA	NA	NA	0	NA
Dissolved Oxygen (mg/L)	NA	NA	NA	8.2	NA
Temperature (C)	NA	NA	NA	28	NA
Salinity (ppt)	NA	NA	NA	0	NA
Total Suspended Solids (ug/L)	NA	NA	NA	--	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-33
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-33A DX330100 UA02326 STSW 0 25-Aug-93	SSD-93-33B DX330200 UA02325 STSW 0 25-Aug-93	SSD-93-33C DX330300 UA02324 STSW 0 25-Aug-93	SSW-93-33C WX3303X1 UA02314 STSW 0 25-Aug-93	SSD-93-33D DX330400 UA02327 STSW 0 25-Aug-93
Hardness (ug/L)	NA	NA	NA	100000	NA
Alkalinity (ug/L)	NA	NA	NA	82000	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA	990	NA
Total Phosphorus (ug/L)	NA	NA	NA	--	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA	100	NA
Anions (ug/L)					
Chloride	NA	NA	NA	25000	NA
Sulfate	NA	NA	NA	13000	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-34
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-34A DX340100 UA02455 STSW 0 30-Aug-93	SSD-93-34B DX340200 UA02456 STSW 0 30-Aug-93	SSD-93-34C DX340300 UA02457 STSW 0 30-Aug-93
Total Organic Carbon (ug/g)	52000	56000	70000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	57	380	570
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	8920	13800	16100
Arsenic	11.2	19.2	18.7
Barium	20.6	39.1	50
Beryllium	--	0.626	0.666
Cadmium	--	1.62	2.5
Calcium	1070	2160	2670
Chromium	17.4	44.2	43.2
Cobalt	--	8.61	8.75
Copper	6.84	20.7	26.1
Iron	12500	23700	24900
Lead	12	82	130
Magnesium	3400	5780	5750
Manganese	89.9	383	634
Nickel	13.9	26.2	28.3
Potassium	704	1510	1560
Sodium	--	132	114
Vanadium	12.1	27.2	28.2
Zinc	33.2	148	203
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	4.3	3	3.2
Bis (2-Ethyl hexyl) Phthalate	--	1.7	1.2
Polynuclear Aromatics			
2-Methylnaphthalene	--	--	0.2
Acenaphthylene	--	0.15	0.51
Fluorene	--	--	0.18
Phenanthrene	--	0.6	1.5
Fluoranthrene	0.071	0.83	1.4
Pyrene	--	1.3	2.3
Benzo (a) Anthracene	--	0.52	1
Chrysene	--	0.78	1.5
Benzo (b) Fluoranthene	--	0.85	1.3
Benzo (k) Fluoranthene	--	0.62	1.1
Pesticides/PCB's (ug/g Soil, ug/L Water)			
Dieldrin	--	0.01	0.025
Endosulfan Sulfate	--	0.04	--
p,p'-DDD	0.007	0.02	0.039
p,p'-DDE	0.007	0.007	0.009
p,p'-DDT	0.006	0.072	0.117

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-34
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-34A DX340100 UA02455 STSW 0 30-Aug-93	SSD-93-34B DX340200 UA02456 STSW 0 30-Aug-93	SSD-93-34C DX340300 UA02457 STSW 0 30-Aug-93
Water Quality Parameters	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-35
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-35A	SSD-93-35B	SSD-93-35C
Field Sample ID	DX350100	DX350200	DX350300
Lab Sample ID	UA02394	UA02395	UA02396
Site Type	STSW	STSW	STSW
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	26-Aug-93	26-Aug-93	26-Aug-93
Total Organic Carbon (ug/g)	42000	43000	19000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	--	400	1200
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	9760	12000	4780
Arsenic	17.8	18	9.25
Barium	26.1	23.7	18.9
Beryllium	0.542	0.553	--
Cadmium	2.53	4.15	2.78
Calcium	1110	1350	1330
Chromium	41.1	34.6	71.8
Cobalt	6.18	9.52	4.21
Copper	19.6	32	17.6
Iron	19300	21500	12700
Lead	91	1900	95
Magnesium	3520	4400	3020
Manganese	274	429	113
Nickel	20.6	33.5	13.3
Potassium	829	762	492
Sodium	--	54.5	--
Vanadium	18.7	21.6	13.3
Zinc	127	162	92.4
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	2.5	6.2 GT	6.2 GT
Bis (2-Ethyl hexyl) Phthalate	6.6	12	1.3
Polynuclear Aromatics			
2-Methylnaphthalene	0.16	0.072	--
Acenaphthylene	1.1	0.3	--
Acenaphthene	0.076	--	--
Fluorene	0.32	--	--
Phenanthrene	3.4	0.32	0.11
Fluoranthrene	5	0.65	--
Pyrene	4.6	0.72	--
Benzo (a) Anthracene	2.8	0.51	--
Chrysene	3.2	0.6	--
Benzo (b) Fluoranthene	3.7	0.9	--
Benzo (k) Fluoranthene	2.7	0.66	--
Benzo (a) Pyrene	2.3	--	--
Benzo (ghi) Perylene	2.2	--	--
Pesticides/PCB's (ug/g Soil, ug/L Water)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-35
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-35A DX350100 UA02394 STSW 0 26-Aug-93	SSD-93-35B DX350200 UA02395 STSW 0 26-Aug-93	SSD-93-35C DX350300 UA02396 STSW 0 26-Aug-93
Water Quality Parameters	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

Table 3-36: System 36 Analytes

No data existing for System 36.

TABLE 3-37
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-37A DX370100 UA02400 STSW 0 26-Aug-93	SSW-93-37A WX3701X1 UA02403 STSW 0 26-Aug-93	SSD-93-37B DX370200 UA02401 STSW 0 26-Aug-93	SSW-93-37B WX3702X1 UA02404 STSW 0 26-Aug-93
Total Organic Carbon (ug/g)	11000	NA	48000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	290	310	200	--
Inorganic Compounds (ug/g Soil, ug/L Water)				
Aluminum	3930	186	6100	--
Arsenic	7.23	3.44	11.3	3.16
Barium	8.98	5.12	21.2	6.23
Calcium	4450	14100	1890	37000
Chromium	18.6	--	27	--
Cobalt	2.76	--	3.58	--
Copper	19.4	--	94.2	39.7
Iron	11100	369	19400	261
Lead	32	24.7	110	--
Magnesium	2400	1180	3150	4490
Manganese	138	--	175	48.3
Nickel	10.5	--	17.7	--
Potassium	541	--	940	1840
Sodium	--	14800	70.4	15400
Vanadium	10.9	--	25.5	98.9
Zinc	54.1	21.3	95.8	--
Volatile Organic Compounds (ug/g Soil, ug/L Water)				
Halogenated Organics				
Trichloroethene	--	--	--	2.3
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Phthalates				
Di-n-butyl Phthalate	1.8	--	5.9	--
Polynuclear Aromatics				
Acenaphthylene	--	--	0.34	--
Phenanthrene	0.18	--	0.18	--
Fluoranthrene	0.13	--	--	--
Pyrene	0.2	--	--	--
Benzo (a) Anthracene	--	--	--	--
Chrysene	--	--	--	--
Other				
Benzyl Alcohol	--	--	0.13	--
Pesticides/PCB's (ug/g Soil, ug/L Water)	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-37
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-37A	SSW-93-37A	SSD-93-37B	SSW-93-37B
Field Sample ID	DX370100	WX3701X1	DX370200	WX3702X1
Lab Sample ID	UA02400	UA02403	UA02401	UA02404
Site Type	STSW	STSW	STSW	STSW
Sample Depth (ft)	0	0	0	0
QC Type				
Collection Date:	26-Aug-93	26-Aug-93	26-Aug-93	26-Aug-93
Water Quality Parameters				
pH	NA	NA	NA	7.2
Conductivity (ms/cm)	NA	NA	NA	0.11
Turbidity (NTU)	NA	NA	NA	0
Dissolved Oxygen (mg/L)	NA	NA	NA	5.7
Temperature (C)	NA	NA	NA	24
Salinity (ppt)	NA	NA	NA	0
Total Suspended Solids (ug/L)	NA	NA	NA	--
Hardness (ug/L)	NA	NA	NA	110000
Alkalinity (ug/L)	NA	NA	NA	65000
Nitrate/Nitrite (ug/L)	NA	NA	NA	290
Total Phosphorus (ug/L)	NA	NA	NA	383
Total Kjedahl Nitrogen (ug/L)	NA	115	NA	71.8
Anions (ug/L)				
Chloride	NA	NA	NA	28000
Sulfate	NA	NA	NA	8600

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-37
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-37C DX370300 UA02531 STSW 0 01-Sep-93	SSD-93-37D DX370400 UA02532 STSW 0 01-Sep-93
Total Organic Carbon (ug/g)	41000	12000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	1400	430
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	4300	6190
Arsenic	24	8.31
Barium	29.9	27.6
Calcium	3070	1510
Chromium	28.9	85.3
Cobalt	3.4	4.52
Copper	21.9	10.9
Iron	9390	16400
Lead	47	110
Magnesium	1770	2680
Manganese	127	161
Nickel	6.99	13.5
Potassium	847	1310
Sodium	96.6	94.7
Vanadium	13.1	12.8
Zinc	66.6	42.9
Volatile Organic Compounds (ug/g Soil, ug/L Water)		
Halogenated Organics		
Trichloroethene	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phthalates		
Di-n-butyl Phthalate	--	4.1
Polynuclear Aromatics		
Acenaphthylene	--	--
Phenanthrene	0.31	0.35
Fluoranthrene	0.29	0.36
Pyrene	0.26	0.25
Benzo (a) Anthracene	0.28	0.25
Chrysene	0.27	0.26
Other		
Benzyl Alcohol	--	--
Pesticides/PCB's (ug/g Soil, ug/L Water)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-37
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-37C DX370300 UA02531 STSW 0 01-Sep-93	SSD-93-37D DX370400 UA02532 STSW 0 01-Sep-93
Water Quality Parameters		
pH	NA	NA
Conductivity (ms/cm)	NA	NA
Turbidity (NTU)	NA	NA
Dissolved Oxygen (mg/L)	NA	NA
Temperature (C)	NA	NA
Salinity (ppt)	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA
Anions (ug/L)		
Chloride	NA	NA
Sulfate	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-38
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-38A DX380100 UA02459 STSW 0 30-Aug-93	SSD-93-38B DX380200 UA02460 STSW 0 30-Aug-93	SSD-93-38C DX380300 UA02462 STSW 0 30-Aug-93	SSD-93-38D DD380400 UA02534 STSW 0 Duplicate 01-Sep-93	SSD-93-38D DX380400 UA02533 STSW 0 01-Sep-93
Total Organic Carbon (ug/g)	61000	23000	31000	NA	23000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	410	360	970	970	11
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	8010	8080	11100	5460	6650
Arsenic	13.4	27.2	14.1	25.3	10.5
Barium	18.6	21.1	33.9	21.6	20.7
Beryllium	--	--	0.546	--	--
Cadmium	--	--	2.18	1.45	3.34
Calcium	1050	602	2880	1250	2410
Chromium	22.6	21.5	30.3	22.1	26.9
Cobalt	2.97	2.83	5.85	4.14	5.29
Copper	72	77.6	28.3	25.5	17.2
Iron	19600	17200	22300	15800	16700
Lead	60	58	130	88	40
Magnesium	3440	3260	5300	2670	3420
Manganese	154	182	267	121	150
Nickel	18.5	16.7	26.7	11.1	12.5
Potassium	778	965	1060	967	731
Sodium	77.8	81	137	87.4	70.8
Vanadium	16.9	15.1	25.5	12.2	18.8
Zinc	71.4	44.8	139	106	127
Volatile Organic Compounds (ug/g Soil, ug/L Water)					
Halogenated Organics					
1,1,1-Trichloroethane	--	--	0.31	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phthalates					
Di-n-butyl Phthalate	3.2	3.4	6.2 GT	3.4	5
Butyl Benzyl Phthalate	--	--	--	--	6.2 GT
Bis (2-Ethyl hexyl) Phthalate	--	--	--	1.1	1.2
Polynuclear Aromatics					
2-Methylnaphthalene	0.11	--	0.17	--	--
Acenaphthylene	0.2	--	0.56	--	0.072
Acenaphthene	0.075	--	0.15	--	--
Fluorene	--	--	0.41	--	--
Phenanthrene	1.3	0.13	4.8	1.1	1.1
Fluoranthrene	1.2	0.12	4.8	0.83	0.9
Pyrene	2.1	--	4.6	0.78	0.4
Benzo (a) Anthracene	0.85	--	3.7	0.62	0.26
Chrysene	1.2	--	3.9	0.57	0.34
Benzo (b) Fluoranthene	1.1	--	3.8	--	--
Benzo (k) Fluoranthene	0.96	--	3	0.33	--
Benzo (a) Pyrene	--	--	3.8	--	--
Benzo (ghi) Perylene	--	--	4.2	--	--
Pesticides/PCB's (ug/g Soil, ug/L Water)	NA	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-38
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-38A DX380100 UA02459 STSW 0 30-Aug-93	SSD-93-38B DX380200 UA02460 STSW 0 30-Aug-93	SSD-93-38C DX380300 UA02462 STSW 0 30-Aug-93	SSD-93-38D DD380400 UA02534 STSW 0 Duplicate 01-Sep-93	SSD-93-38D DX380400 UA02533 STSW 0 01-Sep-93
Water Quality Parameters	NA	NA	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA	NA	NA
Hardness (ug/L)	NA	NA	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA	NA	NA	NA
Anions (ug/L)	NA	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-39
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-39A DX390100 UA02405 STSW 0 27-Aug-93	SSD-93-39B DX390200 UA02406 STSW 0 27-Aug-93
Total Organic Carbon (ug/g)	63000	31000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	1200	1300
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	8370	6910
Arsenic	3.77	10.4
Barium	32.2	15
Beryllium	0.621	--
Calcium	1470	1250
Chromium	30.2	27
Cobalt	4.34	--
Copper	30.1	28.3
Iron	17200	19800
Lead	99	64
Magnesium	3280	2780
Manganese	237	140
Nickel	18.5	16.8
Potassium	1430	1030
Sodium	113	91.2
Vanadium	25.3	16.3
Zinc	136	67.6
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phthalates		
Di-n-butyl Phthalate	2.6	5.6
Bis (2-Ethyl hexyl) Phthalate	3	1.3
Polynuclear Aromatics		
Acenaphthylene	0.097	--
Phenanthrene	0.3	0.17
Fluoranthrene	0.28	--
Pyrene	0.39	--
Pesticides/PCB's (ug/g Soil, ug/L Water)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-39
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-39A DX390100 UA02405 STSW 0 27-Aug-93	SSD-93-39B DX390200 UA02406 STSW 0 27-Aug-93
Water Quality Parameters	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	NA
Anions (ug/L)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-40
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-40A
Field Sample ID	DX400100
Lab Sample ID	UA02461
Site Type	STSW
Sample Depth (ft)	0
QC Type	
Collection Date:	30-Aug-93
Total Organic Carbon (ug/g)	19000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	--
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	11400
Arsenic	17.6
Barium	29.7
Beryllium	0.494
Calcium	1300
Chromium	30.2
Cobalt	5.14
Copper	7.53
Iron	19300
Lead	12
Magnesium	6930
Manganese	237
Nickel	20.5
Potassium	1860
Sodium	96.3
Vanadium	20.3
Zinc	38.8
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phthalates	
Di-n-butyl Phthalate	4.1
Polynuclear Aromatics	
Acenaphthylene	0.11
Fluorene	0.23
Phenanthrene	2.5
Fluoranthrene	1
Pyrene	1.8
Benzo (a) Anthracene	0.59
Chrysene	0.79
Benzo (b) Fluoranthene	0.79
Benzo (k) Fluoranthene	0.87
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-40
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-40A DX400100 UA02461 STSW 0 30-Aug-93
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-41
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-41A DX410100 UA02409 STSW 0 27-Aug-93	SSD-93-41B DX410200 UA02453 STSW 0 30-Aug-93	SSD-93-41C DX410300 UA02454 STSW 0 30-Aug-93	SSD-93-41D DX410400 UA02607 STSW 0 02-Sep-93
Total Organic Carbon (ug/g)	39000	96000	22000	14000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	210	910	440	290
Inorganic Compounds (ug/g Soil, ug/L Water)				
Aluminum	14700	5770	8290	4000
Arsenic	11.4	6.75	5.95	6.45
Barium	71.5	16.6	15.3	17.3
Beryllium	0.962	--	--	--
Calcium	4960	1160	1450	767
Chromium	34.7	44.2	21.3	12.4
Cobalt	9.92	--	3.02	--
Copper	25.3	97.5	14.7	38.1
Iron	28500	15100	16900	18700
Lead	86	230	19	30
Magnesium	4480	2480	4990	1620
Manganese	638	138	160	212
Nickel	22	13.1	13.8	9.09
Potassium	2200	589	864	356
Sodium	392	68	93.2	--
Vanadium	31.4	73.9	32.9	54.8
Zinc	144	66.3	47.1	35.4
Volatile Organic Compounds (ug/g Soil, ug/L Water)				
Aromatics				
Benzene	--	--	--	0.17
Toluene	--	--	--	0.16
Chlorinated Aromatics				
Chlorobenzene	--	--	--	0.13
Water Solubles				
Acetone	--	5.5	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Phthalates				
Di-n-butyl Phthalate	6.1	2.8	4.1	--
Bis (2-Ethyl hexyl) Phthalate	--	6	--	--
Polynuclear Aromatics				
Acenaphthylene	--	--	--	0.28
Phenanthrene	0.27	1.3	0.34	1.3
Fluoranthrene	0.31	1.2	0.45	0.9
Pyrene	0.37	1.8	0.76	1.2
Benzo (a) Anthracene	0.14	0.87	0.24	0.53
Chrysene	0.33	1.1	0.35	0.71
Benzo (b) Fluoranthene	--	1.2	--	--
Benzo (k) Fluoranthene	--	1.2	--	0.66

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-41
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-41A DX410100 UA02409 STSW 0 27-Aug-93	SSD-93-41B DX410200 UA02453 STSW 0 30-Aug-93	SSD-93-41C DX410300 UA02454 STSW 0 30-Aug-93	SSD-93-41D DX410400 UA02607 STSW 0 02-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA	NA
Water Quality Parameters	NA	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA	NA
Hardness (ug/L)	NA	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA	NA
Total Kjeldahl Nitrogen (ug/L)	NA	NA	NA	NA
Anions (ug/L)	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-42
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-42A
Field Sample ID	DX420100
Lab Sample ID	UA02501
Site Type	STSW
Sample Depth (ft)	0
QC Type	
Collection Date:	31-Aug-93
Total Organic Carbon (ug/g)	39000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	46
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	3590
Arsenic	4.5
Barium	5.61
Calcium	271
Chromium	6.1
Iron	6550
Lead	9
Magnesium	1070
Manganese	75
Nickel	4.27
Potassium	424
Vanadium	6.4
Zinc	11.7
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Polynuclear Aromatics	
Acenaphthylene	0.45
Fluorene	0.22
Phenanthrene	1.8
Fluoranthrene	1.3
Pyrene	1.7
Benzo (a) Anthracene	0.69
Chrysene	0.99
Benzo (b) Fluoranthene	0.94
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-43
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-43A DX430100 UA02458 STSW 0 30-Aug-93	SSD-93-43B DD430200 UA02464 STSW 0 Duplicate 30-Aug-93	SSD-93-43B DX430200 UA02463 STSW 0 30-Aug-93	SSD-93-43C DX430300 UA02500 STSW 0 31-Aug-93
Total Organic Carbon (ug/g)	98000	NA	110000	190000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	140	1000	920	1100
Inorganic Compounds (ug/g Soil, ug/L Water)				
Aluminum	6850	8770	9330	7590
Arsenic	8.29	10.1	13.2	11.2
Barium	14.5	36.1	35.9	262
Beryllium	--	--	0.544	--
Boron	--	--	--	13.9
Cadmium	--	2.36	1.91	--
Calcium	606	2310	2300	1600
Chromium	13	26.2	38.7	19.9
Cobalt	--	4.09	4.4	6.11
Copper	6.29	23.2	21.4	22.8
Iron	13700	14700	15000	16400
Lead	17	150	170	47
Magnesium	2400	2750	3400	3010
Manganese	165	209	209	202
Nickel	7.87	15.1	17.4	15.8
Potassium	872	662	694	802
Selenium	--	--	--	0.775
Sodium	62.2	96	136	63.1
Vanadium	17.4	33.2	31.9	34.5
Zinc	21.9	103	97.5	125
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Phenols				
4-Methyl Phenol	--	--	--	0.45
Dibenzofuran	--	1	1.7	2.4
Phthalates				
Di-n-butyl Phthalate	6.2 GT	--	1.7	2.1
Polynuclear Aromatics				
Naphthalene	--	1.5	3	2.8
2-Methylnaphthalene	--	0.41	0.89	1.1
Acenaphthylene	0.15	3.1	5.2	9.3
Acenaphthene	--	0.74	1.3	2.1
Fluorene	0.15	3	5.1	--
Phenanthrene	2.6	12 GT	12 GT	12 GT
Anthracene	--	4.7	7.6	6.2 GT
Fluoranthrene	2.1	6.2 GT	6.2 GT	6.2 GT
Pyrene	2.8	6.2 GT	6.2 GT	6.2 GT
Benzo (a) Anthracene	0.89	12	21	12 GT
Chrysene	1.5	15	12 GT	12 GT
Benzo (b) Fluoranthene	1.7	16	24	12 GT
Benzo (k) Fluoranthene	1.6	12	26	12 GT
Benzo (a) Pyrene	--	13	6.2 GT	6.2 GT
Indeno (1,2,3,cd) Pyrene	--	11	20	12 GT
Dibenzo (a,h) Anthracene	--	2.3	3.9	--
Benzo (ghi) Perylene	--	12	23	12 GT
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-43
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-43A DX430100 UA02458 STSW 0 30-Aug-93	SSD-93-43B DD430200 UA02464 STSW 0 Duplicate 30-Aug-93	SSD-93-43B DX430200 UA02463 STSW 0 30-Aug-93	SSD-93-43C DX430300 UA02500 STSW 0 31-Aug-93
Water Quality Parameters	NA	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA	NA
Hardness (ug/L)	NA	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA	NA
Total Kjeldahl Nitrogen (ug/L)	NA	NA	NA	NA
Anions (ug/L)	NA	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-44
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-44A
Field Sample ID	DX440100
Lab Sample ID	UA02504
Site Type	STSW
Sample Depth (ft)	0
QC Type	
Collection Date:	31-Aug-93
Total Organic Carbon (ug/g)	120000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	810
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	6580
Arsenic	16
Barium	499
Boron	17.5
Calcium	981
Chromium	28.3
Cobalt	4.52
Copper	14.6
Iron	15600
Lead	84
Magnesium	2680
Manganese	157
Nickel	12.9
Potassium	524
Sodium	75
Vanadium	43.8
Zinc	88.3
Volatile Organic Compounds (ug/g Soil, ug/L Water)	
Aromatics	
Benzene	0.12
Toluene	0.13
Chlorinated Aromatics	
Chlorobenzene	0.12
Halogenated Organics	
1,1,1-Trichloroethane	0.43
Phenols	
Dibenzofuran	0.46
Phthalates	
Diethyl Phthalate	3.3
Di-n-butyl Phthalate	3.1
Polynuclear Aromatics	
2-Methylnaphthalene	0.17
Acenaphthylene	1.3
Acenaphthene	0.35
Fluorene	1.4
Phenanthrene	17
Anthracene	2.3
Fluoranthrene	6.2 GT
Pyrene	6.2 GT
Benzo (a) Anthracene	6.5
Chrysene	9.1
Benzo (b) Fluoranthene	12
Benzo (k) Fluoranthene	8.6
Benzo (a) Pyrene	7.3
Indeno (1,2,3,cd) Pyrene	5.1
Dibenzo (a,h) Anthracene	0.86
Benzo (ghi) Perylene	5.5

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-44
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-44A DX440100 UA02504 STSW 0 31-Aug-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-45
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-45A
Field Sample ID	DX450100
Lab Sample ID	UA02505
Site Type	STSW
Sample Depth (ft)	0
QC Type	
Collection Date:	31-Aug-93
Total Organic Carbon (ug/g)	130000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	120
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	5840
Arsenic	19.7
Barium	25.5
Chromium	11.9
Cobalt	2.91
Copper	7.41
Iron	9080
Lead	27
Magnesium	2360
Manganese	262
Nickel	9.06
Potassium	771
Selenium	0.658
Vanadium	10.8
Zinc	33.6
Volatile Organic Compounds (ug/g Soil, ug/L Water)	
Aromatics	
Toluene	0.1
Halogenated Organics	
Bromomethane	0.24
1,1,1-Trichloroethane	0.42
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phenols	
Dibenzofuran	0.69
Phthalates	
Di-n-butyl Phthalate	4.8
Polynuclear Aromatics	
Naphthalene	
2-Methylnaphthalene	0.81
Acenaphthylene	4
Acenaphthene	0.66
Phenanthrene	12 GT
Anthracene	4.2
Fluoranthrene	6.2 GT
Pyrene	6.2 GT
Benzo (a) Anthracene	13
Chrysene	19
Benzo (k) Fluoranthene	13
Benzo (a) Pyrene	11
Indeno (1,2,3,cd) Pyrene	5.6
Dibenzo (a,h) Anthracene	1.1
Benzo (ghi) Perylene	6.2

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-45
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-45A DX450100 UA02505 STSW 0 31-Aug-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	--
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-46
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-46A
Field Sample ID	DX460100
Lab Sample ID	UA02503
Site Type	STSW
Sample Depth (ft)	0
QC Type	
Collection Date:	31-Aug-93
Total Organic Carbon (ug/g)	19000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	65
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	4550
Arsenic	7.55
Barium	15.2
Calcium	304
Chromium	6.79
Copper	4.16
Iron	7680
Lead	18.3
Magnesium	1110
Manganese	82.8
Nickel	4.57
Potassium	358
Vanadium	9.48
Zinc	14.7
Volatile Organic Compounds (ug/g Soil, ug/L Water)	
Aromatics	
Toluene	0.12
Chlorinated Aromatics	
Chlorobenzene	0.14
1,3-Dichlorobenzene	0.17
Halogenated Organics	
Tetrachloroethene	0.17
Polynuclear Aromatics	
Acenaphthylene	0.26
Fluorene	0.28
Phenanthrene	3.5
Fluoranthrene	2.8
Pyrene	3.6
Benzo (a) Anthracene	1.4
Chrysene	2
Benzo (b) Fluoranthene	2.1
Benzo (k) Fluoranthene	2.1
Benzo (ghi) Perylene	1.1

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-46
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-46A DX460100 UA02503 STSW 0 31-Aug-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-47
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-47A DX470100 UA02502 STSW 0 31-Aug-93
Total Organic Carbon (ug/g)	29000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	23
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	4010
Arsenic	11
Barium	12.9
Calcium	387
Chromium	7.53
Iron	5560
Lead	7.13
Magnesium	1180
Manganese	117
Nickel	4.55
Potassium	449
Vanadium	5.39
Zinc	16.7
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phthalates	
Di-n-butyl Phthalate	4.6
Polynuclear Aromatics	
2-Methylnaphthalene	0.067
Acenaphthylene	1.2
Acenaphthene	0.071
Phenanthrene	4.5
Fluoranthrene	3.4
Pyrene	5.6
Benzo (a) Anthracene	2.5
Chrysene	3.3
Benzo (b) Fluoranthene	2.5
Benzo (k) Fluoranthene	2.3

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-47
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-47A DX470100 UA02502 STSW 0 31-Aug-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-48
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-48A
Field Sample ID	DX480100
Lab Sample ID	UA02506
Site Type	STSW
Sample Depth (ft)	0
QC Type	
Collection Date:	31-Aug-93
Total Organic Carbon (ug/g)	110000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	190
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	8880
Arsenic	7.61
Barium	70
Calcium	3510
Chromium	18.9
Cobalt	7.12
Copper	17.3
Iron	11700
Lead	55
Magnesium	3260
Manganese	441
Nickel	16
Potassium	878
Sodium	62.1
Vanadium	20
Zinc	146
Volatile Organic Compounds (ug/g Soil, ug/L Water)	
Halogenated Organics	
Dibromochloromethane	1.5
1,1,2-Trichloroethane	1
Bromoform	6.3
1,1,2,2-Tetrachloroethane	11
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phthalates	
Di-n-butyl Phthalate	4.9
Polynuclear Aromatics	
Naphthalene	
2-Methylnaphthalene	0.22
Acenaphthylene	4
Acenaphthene	0.36
Fluorene	1.7
Phenanthrene	22
Anthracene	2.8
Fluoranthrene	6.2 GT
Pyrene	6.2 GT
Benzo (a) Anthracene	8.9
Chrysene	14
Benzo (b) Fluoranthene	11
Benzo (k) Fluoranthene	9.1
Indeno (1,2,3,cd) Pyrene	4.9
Dibenzo (a,h) Anthracene	1.1
Benzo (ghi) Perylene	5.9

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-48
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-48A DX480100 UA02506 STSW 0 31-Aug-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-49
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-49A DD490100 UA02508 STSW 0 Duplicate 31-Aug-93	SSD-93-49A DX490100 UA02507 STSW 0 31-Aug-93	SSD-93-49B DX490200 UA02631 STSW 0 03-Sep-93
Total Organic Carbon (ug/g)	NA	49000	89000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	29	28	180
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	4760	5060	7270
Arsenic	4.66	6.05	9.24
Barium	16.2	16.3	30.4
Calcium	795	589	1420
Chromium	6.73	7.64	20.3
Cobalt	--	3.76	4.46
Copper	--	4.25	6.28
Iron	6790	7840	11700
Lead	13.4	11	66
Magnesium	1190	1640	2800
Manganese	184	175	562
Nickel	6.05	11.2	12.4
Potassium	640	612	863
Sodium	51.8	--	56.7
Vanadium	6.89	8.12	18.5
Zinc	19	23.1	48.2
Volatile Organic Compounds (ug/g Soil, ug/L Water)			
Halogenated Organics			
Trichloroethene	0.3	0.61	--
Dibromochloromethane	--	0.29	--
Bromoform	0.21	1.2	--
1,1,2,2-Tetrachloroethane	0.47	2.6	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phenols			
Dibenzofuran	--	--	1.4
Phthalates			
Di-n-butyl Phthalate	2.7	1.7	--
Polynuclear Aromatics			
2-Methylnaphthalene	--	--	0.7
Acenaphthylene	0.34	0.28	9.7
Acenaphthene	--	--	1.1
Fluorene	0.28	0.39	5.6
Phenanthrene	4.5	4.5	12 GT
Anthracene	--	--	5.7
Fluoranthrene	3.6	3.2	6.2 GT
Pyrene	3.8	3.5	6.2 GT
Benzo (a) Anthracene	1.6	1.6	12 GT
Chrysene	2.3	2.1	16
Benzo (b) Fluoranthene	2.3	1.6	12 GT
Benzo (k) Fluoranthene	1.4	1.5	19
Benzo (a) Pyrene	--	--	6.2 GT
Indeno (1,2,3,cd) Pyrene	--	--	12
Dibenzo (a,h) Anthracene	--	--	2.7
Benzo (ghi) Perylene	1.1	--	14

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-49
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-49A DD490100 UA02508 STSW 0 Duplicate 31-Aug-93	SSD-93-49A DX490100 UA02507 STSW 0 31-Aug-93	SSD-93-49B DX490200 UA02631 STSW 0 03-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA	NA
Water Quality Parameters	NA	NA	NA
Total Suspended Solids (ug/L)	NA	NA	NA
Hardness (ug/L)	NA	NA	NA
Alkalinity (ug/L)	NA	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA	NA
Total Phosphorus (ug/L)	NA	NA	NA
Total Kjeldahl Nitrogen (ug/L)	NA	NA	NA
Anions (ug/L)	NA	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-50
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-50A DX500100 UA02530 STSW 0 01-Sep-93
Total Organic Carbon (ug/g)	75000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	430
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	5440
Arsenic	10.3
Barium	15.3
Calcium	1150
Chromium	9.55
Cobalt	3.8
Copper	6.25
Iron	10500
Lead	18.4
Magnesium	2650
Manganese	137
Nickel	9.05
Potassium	416
Vanadium	13.8
Zinc	20.6
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phenols	
Dibenzofuran	4.2
Phthalates	
Di-n-butyl Phthalate	1.8
Polynuclear Aromatics	
Naphthalene	9.4
2-Methylnaphthalene	1.8
Acenaphthylene	7.2
Acenaphthene	2.3
Fluorene	11
Phenanthrene	12 GT
Anthracene	11
Fluoranthrene	6.2 GT
Pyrene	6.2 GT
Benzo (a) Anthracene	14
Chrysene	18
Benzo (b) Fluoranthene	17
Benzo (k) Fluoranthene	13
Benzo (a) Pyrene	6.2 GT
Indeno (1,2,3,cd) Pyrene	10
Dibenzo (a,h) Anthracene	2.6

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-50
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-50A DX500100 UA02530 STSW 0 01-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-51
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-51A DX510100 UA02536 STSW 0 01-Sep-93
Total Organic Carbon (ug/g)	20000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	74
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	6390
Arsenic	10.3
Barium	15.2
Calcium	1090
Chromium	9.11
Cobalt	3.51
Copper	4.92
Iron	8330
Lead	9.02
Magnesium	1520
Manganese	133
Nickel	7.02
Potassium	659
Sodium	52.4
Vanadium	9.98
Zinc	151
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phthalates	
Di-n-butyl Phthalate	4.6
Polynuclear Aromatics	
Acenaphthylene	0.087
Phenanthrene	0.3
Fluoranthrene	0.26
Pyrene	0.17
Benzo (a) Anthracene	0.11
Chrysene	0.2
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-51
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-51A DX510100 UA02536 STSW 0 01-Sep-93
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-52
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-52A DX520100 UA02535 STSW 0 01-Sep-93
Total Organic Carbon (ug/g)	41000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	1200
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	4750
Arsenic	9.64
Barium	37.7
Calcium	831
Chromium	9.94
Cobalt	3.56
Copper	7.82
Iron	9510
Lead	40
Magnesium	1710
Manganese	175
Nickel	8.35
Potassium	432
Vanadium	13.1
Zinc	35
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phenols	
Dibenzofuran	0.52
Polynuclear Aromatics	
2-Methylnaphthalene	0.25
Acenaphthylene	3.8
Acenaphthene	0.55
Fluorene	1.7
Phenanthrene	20
Anthracene	4.1
Fluoranthrene	6.2 GT
Pyrene	10
Benzo (a) Anthracene	9.5
Chrysene	9.5
Benzo (b) Fluoranthene	9.6
Benzo (k) Fluoranthene	5.3
Benzo (a) Pyrene	6.5
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-52
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-52A DX520100 UA02535 STSW 0 01-Sep-93
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-53
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-53A
Field Sample ID	DX530100
Lab Sample ID	UA02537
Site Type	STSW
Sample Depth (ft)	0
QC Type	
Collection Date:	01-Sep-93
Total Organic Carbon (ug/g)	220000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	150
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	4400
Arsenic	3.93
Barium	31.8
Calcium	2700
Chromium	13.7
Copper	6.28
Iron	7190
Lead	8.48
Magnesium	1700
Manganese	176
Nickel	7.98
Potassium	928
Vanadium	8.46
Zinc	55.2
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phenols	
Dibenzofuran	1.1
Polynuclear Aromatics	
2-Methylnaphthalene	0.45
Acenaphthylene	1.9
Acenaphthene	1.4
Fluorene	2.9
Phenanthrene	12 GT
Anthracene	4.2
Fluoranthrene	6.2 GT
Pyrene	6.2 GT
Benzo (a) Anthracene	11
Chrysene	9.7
Benzo (b) Fluoranthene	7.3
Benzo (k) Fluoranthene	6
Benzo (a) Pyrene	5.5
Dibenzo (a,h) Anthracene	0.84
Benzo (ghi) Perylene	2.8
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-53
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-53A DX530100 UA02537 STSW 0 01-Sep-93
Water Quality Parameters	NA
Total Suspended Solids (ug/L)	NA
Hardness (ug/L)	NA
Alkalinity (ug/L)	NA
Nitrate/Nitrite (ug/L)	NA
Total Phosphorus (ug/L)	NA
Total Kjeldahl Nitrogen (ug/L)	NA
Anions (ug/L)	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-54
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-54A	SSD-93-54A
Field Sample ID	DD540100	DX540100
Lab Sample ID	UA02606	UA02605
Site Type	STSW	STSW
Sample Depth (ft)	0	0
QC Type	Duplicate	
Collection Date:	02-Sep-93	02-Sep-93
Total Organic Carbon (ug/g)	34000	7200
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	810	1100
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	4640	5120
Arsenic	8.07	12.1
Barium	507	9.64
Boron	25.4	--
Calcium	513	635
Chromium	12.8	12.6
Cobalt	3.27	--
Copper	6.67	6.73
Iron	10100	9590
Lead	37	42
Magnesium	1880	1820
Manganese	71.2	145
Nickel	8.25	7.76
Potassium	286	377
Vanadium	23.2	16.7
Zinc	27.5	20
Volatile Organic Compounds (ug/g Soil, ug/L Water)	--	--
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phenols		
Dibenzofuran	1.7	1.7
Polynuclear Aromatics		
Naphthalene	2.3	2
2-Methylnaphthalene	0.62	0.56
Acenaphthylene	3	2.3
Acenaphthene	1.6	2
Fluorene	4.5	4.6
Phenanthrene	12 GT	12 GT
Anthracene	6.6	6.2
Fluoranthrene	6.2 GT	6.2 GT
Pyrene	6.2 GT	6.2 GT
Benzo (a) Anthracene	18	17
Chrysene	17	22
Benzo (b) Fluoranthene	26	22
Benzo (k) Fluoranthene	16	19
Benzo (a) Pyrene	6.2 GT	6.2 GT
Indeno (1,2,3,cd) Pyrene	9.1	8.9
Benzo (ghi) Perylene	10	9.3
Pesticides/PCBs (ug/g Soil, ug/L Water)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

TABLE 3-54
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-54A DD540100 UA02606 STSW 0 Duplicate 02-Sep-93	SSD-93-54A DX540100 UA02605 STSW 0 02-Sep-93
Water Quality Parameters	NA	NA
Total Suspended Solids (ug/L)	NA	NA
Hardness (ug/L)	NA	NA
Alkalinity (ug/L)	NA	NA
Nitrate/Nitrite (ug/L)	NA	NA
Total Phosphorus (ug/L)	NA	NA
Total Kjeldahl Nitrogen (ug/L)	NA	NA
Anions (ug/L)	NA	NA

Notes:
-- = Not detected or less than detection limit
NA = Not Analyzed
GT = Greater than detection limit
SSD = Sediment
SSW = Surface Water

Table 3-55: System 55 Analytes

No data existing for System 55.

4.0 Storm Sewer System Evaluation

The analytical data for the sediment and water samples collected from the storm sewer systems at Fort Devens during the summer of 1993 have been evaluated to determine if there are any contaminant trends within the storm sewer systems and to identify those systems with elevated concentrations of analytes as compared to the entire data set. The purpose of the evaluation is to determine whether there are any potential sources of contamination associated with the storm sewer system that have not been identified through other studies. Those systems identified as having high concentrations of analytes of concern, as compared with data from the other storm sewer systems sampled, are identified as systems of concern or as systems with isolated elevated analytes. The methods employed to determine systems of concern are discussed in Section 4.1.1 and 4.1.2.

4.1 Methodologies for System Evaluation

4.1.1 Lognormal Frequency Analysis

To evaluate the storm sewer data generated from this study, an EPA Water Planning Division study conducted in 1983 entitled *Results of the Nationwide Urban Runoff Program (NURP)*, was consulted for guidance. This EPA study stated that,

> Urban runoff flows and concentrations are quite variable. Due to the high variability of urban runoff, a large number of sites and storm events were monitored, and a statistical approach was used to analyze the data. Standard statistical procedures allowed probability distributions or frequency of occurrence to be examined and tested. Since the underlying distributions were determined to be adequately represented by the lognormal distribution, the log (basee) transforms of all urban runoff data were used in developing the statistical characterizations.

The analytical technique used to evaluate results for the NURP can be applied to Fort Devens. The NURP Program found that "geographic location, land use, or other factors (e.g., slope, population density, precipitation characteristics) appear to have little utility in consistently explaining overall site-to-site variability in urban runoff or predicting the characteristics of urban runoff from unmonitored sites." This means that a frequency lognormal analysis of data can be used to evaluate sites with different characteristics.

The analytical results from sampling the storm sewer systems at Fort Devens were evaluated assuming a lognormal distribution of data. The analysis was accomplished by plotting the concentrations of all detected data logarithmically on the y-axis, versus the frequency distribution of data on the x-axis. The frequency number was calculated by first ordering and numbering analytical results of the compounds of concern from lowest to highest. The number of each data point was then divided by the total number of data points plus 1 and the result was multiplied by 100. This calculation is illustrated below:

$$F = [D/(N + 1)] \times 100$$

where:
- F = frequency number
- D = data number (the lowest result is assigned a 1, the next lowest a 2, etc.)
- N = total number of data points

Non-detected results were used to calculate N, but are not shown on the plot graphs because they cannot be quantified.

A lognormal frequency plot provides information on data that are lognormally distributed. These plots will easily show statistical outliers to the lognormal distribution. For the storm water evaluation all analytes were assumed lognormally distributed. This assumption applies because of the large data set of analytes. Because of the size of the data set and the results of the NURP study, the lognormal distribution would hold true even for such analytes as semivolatile organic compounds and pesticides. These analytes may not typically be assumed to be lognormally distributed in the environment. Storm sewer systems, however, accept a variety of "contaminants" that are prevalent in the drainage systems. For example, semivolatile organic compounds are commonly associated with asphalt compounds and oil and grease from roadway runoff. In addition, pesticides are commonly found in the environment in low concentrations. The lognormal frequency graph shows the statistical outliers to these normal "baseline" concentrations. As a result, for the AREE 70 evaluation purposes, systems of concern resulting from potential sources of contamination could be readily identified.

As noted previously, selected analytical laboratory data for the sediment and water samples collected from the storm sewer systems at Fort Devens during the summer of 1993 have been graphed on probability scales by individual analyte (see Figures 4-1 through 4-27 and Appendix C). Data points identified on the graphs indicate the sample location. Only data points identified as "outliers" to the baseline are labelled. Tables 4-1, 4-2, and 4-3 summarize the results of the analyses by system and identify

the analyte outliers. Selected analytes were chosen because they represent a cross-section of typical industrial contaminants.

The following analytes that have been graphed:

Metals	Arsenic, barium, beryllium, cadmium, cobalt, chromium, copper, lead, nickel, selenium, vanadium, and zinc
Pesticides	DDD, DDE, DDT, and total pesticides
Volatile Organic Compounds	Benzene, 1,1,1-trichloroethane, perchloroethylene, 1,1,2,2-tetrachloroethene, and 1,2-dichloroethene
Semivolatile Organic Compounds	Anthracene, benzo(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, phenanthrene, and pyrene
Total Petroleum Hydrocarbons	TPH

These analytes were selected because they are indicative of the analytes typically associated with vehicle/motor repair and industrial operations. Analysis of the lognormal frequency graphs for these analytes indicates those areas where contaminants from motor repair or industrial operations may be impacting the storm sewer system.

There is a large pool of analytical data for sediment samples than for water samples because many of the originally proposed sample collection locations for storm water samples were dry. Therefore, water samples could not be collected at a number of proposed sampling sites. The fact that collected samples are predominantly sediment samples, however, should not significantly alter the analyses or conclusions of this report. Most contaminants accumulate in sediments, therefore, focusing on sediments offers a conservative basis for analysis. Furthermore, because the water column and sediments strive for equilibrium partitioning of the analytes, similar trends between water and sediment are expected. The principal exception would be for volatile organic carbon compounds. Volatilization of these compounds would be expected in the sediments exposed to the atmosphere. As a result, the concentration of volatile organic compounds may be reduced in sediments. However, the purpose of this study was to examine the presence of these compounds and whether they indicate sources of contamination not previously identified in other studies. Because there is a larger pool of data for sediment than surface water, analyses were conducted on the sediment data, and the surface water data were used to support the conclusions reached using the sediment data set.

To evaluate the data, each analyte graph was reviewed individually for concentrations considered to be statistical outliers. Outliers, in the context of this study, are defined as concentrations that fall above the linear frequency distribution anticipated for storm water data plotted on a lognormal frequency scale. The lognormal frequency graphs are analyzed using a line of best fit to determine the linear frequency. Data points falling on the line of best fit are determined to be lognormally distributed. These data points are not determined to be potential points of contamination. If the curve falls to the right of the line of best fit, without a marked increase in analyte concentration indicating separate distinct populations, then those sample points to the right indicate a relative depletion of analyte concentration compared to the lognormal frequency distribution. Those systems would not be flagged as having potential sources of contamination. A few of the lognormal frequency graphs appear to have a limited number of data points (e.g., vanadium, selenium, and volatile organic compounds). Only those points with concentrations above the detection limit are graphed. All the non-detects or analytes at the detection limit are not graphed.

In determining which systems exhibit analyte concentrations of concern for sediment, a two-step evaluation process was used. First, all systems that have three or more total data point outliers were flagged. A determination was made in choosing systems that had three or more outliers because these systems were considered to represent a trend. For example, system #1 indicates outliers in sediment for the analytes anthracene, fluoranthene, and pyrene, and is determined to be a system of concern.

To be certain other potential analytes of concern were considered, a second step was taken once all of the systems exhibiting three or more outliers were identified. Printouts of the data that organized the analytical results by analyte parameter and concentration were consulted. Analytes for which graphs had not been developed were examined to evaluate if the systems with the highest recorded concentrations of a certain analyte had already been flagged as "systems of concern." This step not only served to reconfirm the original conclusions, but also indicated instances where systems that had not been flagged required closer examination. After identifying systems with elevated concentrations of analytes as compared to other systems, the associated land use was examined to identify potential new AREEs.

Once all of the sediment data were evaluated, the water data was reviewed. As noted previously, there was not as much data for water because many of the originally proposed sample points were dry during the sampling program. Therefore, the approach taken to determine systems of concern for water differed slightly from the approach used for sediment. All systems that had three or more outliers were flagged as systems of concern for water. In instances where there were less than three outliers for water, the sediment data were reviewed to establish whether the system was already a concern for sediment. If a system had one or more outliers for water and

was already flagged for sediment, it was considered to be of concern for water as well.

Systems #41 through #55 at the airfield on the North Post were evaluated for semivolatile organic compounds separately from the systems on the Main Post. The systems at the airfield were grouped due to the unique and consistent land use of the airfield. Systems #41 through #55 have been associated with airfield operations since 1943. All other analytes were analyzed with the Main Post data. Analyzing semivolatile organic compound data separately recognizes the fact that these compounds are common degradation products of the combustion of petroleum products including jet-fuel.

Any of the systems numbered between #1 and #40 that are not described in Section 4.1 or 4.2 of this report do not have outliers for any of the compounds plotted on probability graphs. The systems located at the airfield (Systems #41 through #55) are detailed in Section 4.3 of this report.

The analytical data generated for the AREE 70 study was not compared against any ecological or human health risk standards. It was determined that there is a very low probability of exposure to these contaminants from either humans or biota. Because of this limited exposure and the limited extent of contamination, it was determined that published ecological or human health standards were not appropriate for comparison. This study only focused on contaminants detected within the storm sewer systems. The evaluation did not evaluate the storm sewer's impact on receiving waters.

4.1.2 Trend Analysis

After the data were analyzed using a lognormal frequency approach, two trend analyses were performed. The first trend analysis qualitatively examined the trends of contaminants found in each system of concern or isolated elevated analyte system. The purpose of the trend analysis was to determine if data from chemical analysis showed trends between two or more sample locations within a system of concern or isolated elevated analyte system and to determine whether or not current or historical land use correlates to the trend.

The second trend analyses qualitatively examined AOCs, SAs, and AREEs associated with the storm sewer systems. The contaminants identified in each storm sewer system were qualitatively compared to the operations or contaminants associated with each AOC, SA, or AREE. Section 4.4 discusses the approach and results of this evaluation.

4.2 Results of the Lognormal Frequency and Trend Analyses

The storm sewer systems were categorized and evaluated based on the lognormal frequency analysis as described in Section 4.1.1. Two categories were defined from the analysis: (1) systems of concern and (2) isolated elevated analytes. In addition to the lognormal frequency analysis, a chemical trend analysis was performed within each system.

Systems of concern are those systems with elevated concentrations of analytes chosen for examination as compared to the other systems. In evaluating the sediment and water data in accordance with the methods described in Section 4.1.1, ten systems emerged as systems of concern for sediment at Fort Devens. However, because systems #2, #3, and #4 are combined, there are eight systems of concern after this grouping. No new systems of concern were identified from the water data. Systems of concern had three or more statistical outliers based on a lognormal frequency graph of the data concentration (see Figures 4-1 through 4-27). These systems may also have demonstrated consistently high-end concentrations by analyte in a data printout by analyte parameters and concentrations. Each of the systems of concern in this section discuss types of outliers and historical land use.

In making determinations as to which systems exhibited analyte concentrations of concern, the results were evaluated for trends that appeared as outliers on the lognormal frequency graphs. This section also addresses all of the other systems that were found to have less than three outliers (i.e., isolated elevated analytes). The purpose of the trend analysis was to determine if data from chemical analysis showed trends between two or more sample locations within a system of concern or isolated elevated analyte system and to determine whether or not if current or historical land use correlates to the trend. Systems of concern included systems 1, 2, 3, 4, 5, 6, 7, 11, 14, and 33. Isolated Elevated Analyte Systems included systems 9, 12, 20, 21, 25, 28, 35, and 37.

When discussing sample locations within a system, the outfall or farthest downstream location is labeled "system #A" and any location upgradient from that is labeled "system #B," "system #C," etc., unless otherwise specified. Trends were defined if there were obvious increasing or decreasing chemical concentrations from the upstream locations to the outfall location.

4.2.1 System #1 - System of Concern

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #1 had outliers for three semivolatile organic compounds in sediment: anthracene, fluoranthene, and pyrene. It also exhibited outliers in water for copper and lead.

There were no additional compounds (which have not been plotted on the graph) found as highest concentrations when the data were reviewed by analyte parameter and concentration.

As noted in Section 3.1, system #1 has historically been occupied by a railyard, with more recent use as a vehicle storage area. The area is currently occupied by the Massachusetts Army National Guard.

Contaminant Trend Analysis and Land Use Correlation. No distinct chemical trends were identified in sediment samples for this system. However, the sample from location 1B, which was collected adjacent to the Massachusetts Army National Guard compound and is located upgradient of location 1A (the system outfall), had slightly higher TOC and TPH concentrations. System #1 drains the Massachusetts Army National Guard compound and there are no AOCs, SAs, and AREEs associated with system #1. The concentrations of contaminants detected in system #1 do not clearly indicate any contaminant trends.

4.2.2 Systems #2, #3, and #4 - System of Concern

Lognormal Frequency Analysis. Systems #2, #3, and #4 are presented together because systems #2 and #3 are connected and the lower portion of system #4 drains into system #3 (refer to Section 3.0).

The lognormal frequency graphs indicated that system #2 had outliers for two semivolatile organic compounds, fluoranthene and pyrene in sediment. System #2 also exhibited an outlier in water for arsenic. When the data printout by analyte parameter and concentration is consulted, system #2 does not appear to have any analytes of highest concentrations. As noted in Sections 3.2 and 3.3, historical land use associated with system #2 has consistently been a roadway.

System #3 had outliers for metals, volatile organic, and semivolatile organic compounds in sediment, as follows: chromium, vanadium, perchloroethylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, and pyrene. System #3 also had one outlier in water for lead. This system has the highest concentration in sediment for the following compounds (which have not been plotted on graphs): 2-methylphenol, 4-methylphenol, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, and indeno(1,2,3-c,d)pyrene. System #3 has been occupied by motor pools, vehicle repair shops and vehicle storage yards since 1943. Current land use in system #3 is vehicle repair and storage by the Massachusetts Army National Guard.

System #4 had no outliers for sediment or water.

System Trend Analysis and Land Use Correlation. Only one location, sample point 2A, was sampled within system #2 for chemical analysis of sediment and surface water. System #2 drains the Massachusetts Army National Guard compound and there are no AOCs, SAs, or AREEs associated with this system. The concentrations of polynuclear aromatic compounds detected in the system may indicate potential contamination from the motor repair operations at the National Guard compound.

For sediment samples at systems #3 and #4, no distinct trend was identified. However, the sample from location 3A, which was collected upgradient within system #3 and adjacent to the Massachusetts Army National Guard compound had slightly higher TPH values than samples from locations 3B and 4A. The sample from point 4A, which was collected adjacent to AOCs 44 and 52, had the lowest concentrations of all analytes, with the exception of TPH, concentrations which range between the concentrations detected in samples from locations 3A and 3B. Sample point 3B, which was collected at the system's outfall, had the highest concentrations of several polynuclear aromatic compounds. It appears from this trend analyses that no single AOC, SA, or AREE may be contributing contaminants to system #3. Contamination, however, from a number of possible sources, including AOCs 44 and 52, AREE 61AU, 61B and the National Guard, are being transported to the outfall and deposited in the sediment.

Surface water samples were collected at the same locations as sediment samples for all three systems. No clear chemical trends of any analyte were identified for the surface water samples.

4.2.3 System #5 - System of Concern

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #5 had outliers for metals and one semivolatile organic compound in sediment: arsenic, beryllium, cobalt, chromium, nickel, and pyrene. No water samples were collected from system #5.

When the data printout by analyte parameter and concentration is consulted, system #5 has the highest concentration in sediment for the following compounds (which have not been plotted on graphs): aluminum, potassium, and magnesium.

As noted in Section 3.5, system #5 has been occupied by motor pools, vehicle repair shops, and vehicle storage yards since 1943, with more recent use as a vehicle repair and storage area.

System Trend Analysis and Land Use Correlation. Only the outfall of system #5 was sampled for chemical analysis of sediment. Therefore, no distinct contaminant

trend can be identified in this system. System #5 primarily drains the Massachusetts Army National Guard Compound. The National Guard operations include motor repair, vehicle storage and training facilities. Some of the contaminants identified in System #5 may be attributed to these operations. In addition, AOCs 44 and 52 are associated with system #5 and may be contributing contaminants to the system. These AOCs are recommended for remediation; therefore, source control of contaminants will be achieved through the soil removal action.

4.2.4 System #6 - System of Concern

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #6 had outliers for several metals in sediment: arsenic, chromium, and lead. It also exhibited outliers in water for arsenic and lead.

When the data printout by analyte parameter and concentration is consulted, system #6 has the highest concentration in sediment for tin (which was not plotted on a graph).

As noted in Section 3.6, system #6 has historically been occupied by a commissary and vehicle storage/maintenance facility. System #6 also was a receptor of the fuel spill that was investigated as part of SA 57.

System Trend Analysis and Land Use Correlation. Three sediment samples were collected within system #6. The sample from sample location 6A, which was collected adjacent to Building 3713 and SA 57, had the highest concentration of TPH compared to samples from sample points 6B and 6C. Sample 6B was collected at the system's outfall. This sample point had the highest concentrations of copper, lead, tin, and zinc, which may be attributable to SA 38. In addition, system #6 had outliers identified for lead, arsenic, and chromium, which may be indicative of operations at SA 38. Sample 6C was collected in the parking lot of Building 3712 (AREE 61AA). The concentrations of contaminants detected were not the highest within system #6 and may be generally correlated with parking lot runoff at AREE 61AA. As a result, it appears that any residual contamination detected within system #6 and at the system's outfall could be attributed to SA 38 and SA 57.

Two surface water samples were collected at sample points 6A and 6B. In general, the sample from location 6A, the upgradient location, has higher concentrations for most contaminants than the sample from location 6B (the system's outfall), particularly for TPH and inorganic compounds. Based upon the relative concentration of contaminants detected in surface water samples in system #6, these contaminants appear to correlate with the contaminant trends detected in SA 38 and SA 57.

4.2.5 System #7 - System of Concern

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #7 had outliers for several metals in sediment: arsenic, barium, beryllium, cobalt, and nickel. There were no outliers for water in system #7.

When the data printout by analyte parameter and concentration is consulted, system #7 has the highest concentration in sediment for manganese and sodium. These have not been plotted on graphs.

As noted in Section 3.7, system #7 is near to a driver training facility to the northwest and railroad tracks to the west. Cold Spring Brook lies beyond Barnum Road, east of system #7.

System Trend Analysis and Land Use Correlation. Two sediment samples were collected within system #7. The sample from sample point 7A was collected within the system and the sample from sample point 7B was collected at the outfall. Sample point 7B had higher concentrations than 7A for TOC and inorganic compounds, specifically, cobalt, iron, aluminum, barium, lead, manganese, nickel, and zinc. However, there are no AOCs, SAs, or AREEs associated with system #7. These contaminants may be attributed to the historical railroad tracks and associated activities.

4.2.6 System #11 - System of Concern

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #11 had outliers for pesticides and volatile organic compounds in sediment: DDD, DDT, total pesticides, and 1,2-dichloroethene. There were no water samples taken at system #11.

When the data printout by analyte parameter and concentration is consulted, system #11 has the highest concentration for the following compounds (which have not been plotted on a graph): endosulfan II, heptachlor epoxide, and 2-methyl naphthalene.

As noted in Section 3.11, historical land use near system #11 includes an elementary school and the contractor's yard at the DRMO that had been used for coal storage. Evidence of coal remains at the contractor's yard.

System Trend Analysis and Land Use Correlation. Two sediment samples were collected from system #11. The sample from sample point 11B was collected within the system and the sample from 11A was collected at the system's outfall. Sample 11B was collected downgradient of the DRMO contractor's yard (AREE 61BD).

There are no other AOCs, SAs, or AREEs associated with this system. There is a decreasing trend for analytes detected at sample location 11B as compared to the outfall sample 11A. Higher concentrations of TPH, pesticides, and inorganic compounds were detected at the upgradient location 11B. However, 1,2-dichloroethane was detected at the system's outfall. It appears, in general, that contaminants that may be attributed to AREE 61BD are not being transported downstream to the system outfall. As a result, the probable source of contamination is being studied further under the supplemental BRAC EE investigations.

4.2.7 System #14 - System of Concern

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #14 had outliers for pesticides and a volatile organic compound in sediment: DDD, DDE, DDT, and benzene. Water samples taken at system #14 had outliers in pesticides and metals, as follows: DDD, DDE, DDT, total pesticides, arsenic, barium, lead, and vanadium.

When the data printout by analyte parameter and concentration is consulted, system #14 does not have the highest concentration for any additional compounds.

As noted in Section 3.14, historical land use near system #14 includes an historical motor pool located at the corner of Carey and St. Mihiel Streets, which was originally constructed in 1942 (AREE 61Z).

System Trend Analysis and Land Use Correlation. Four sediment samples were collected within system #14. This system has two outfalls where samples 14A and 14C were collected. Two upstream samples were collected at sample points 14B and 14D. No distinct trends were identified within the system. Sample point 14A, however, did have the highest concentrations of pesticides relative to the other sample locations. Sample point 14C had the highest concentrations of polynuclear aromatic compounds as compared to the other sample locations. The only associated AOC, SA, or AREE that would likely impact system #14 is AREE 61Z, an historical motor pool. The higher concentrations of polynuclear aromatic compounds detected at sample point 14C correlates with the location of AREE 61Z. This AREE is being further studied under the supplemental BRAC EE investigations. Volatile organic compounds were detected in sample 14B, however, the concentrations of these compounds were very low. Sample point 14D did not show elevated concentrations of contaminants relative to the other sample points, which is expected since there are no sources of contaminants that would discharge to this location.

Two surface water sample locations were collected at locations 14A and 14B. No distinct trends were identified. Location 14A (at the outfall) had higher concentrations of inorganic compounds.

4.2.8 System #33 - System of Concern

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #33 had outliers in metals and volatile organic compounds in sediment for the following analytes: arsenic, chromium, cobalt, nickel, and 1,2-dichloroethene. There were no water samples taken at system #33.

When the data printout by analyte parameter and concentration is consulted, system #33 has the highest concentration in sediment for iron (which has not been plotted on a graph).

As noted in Section 3.33, historical land use near system #33 includes a motor pool, which was originally constructed in the 1960s. The central and eastern portions of the system transverses the golf course.

System Trend Analysis and Land Use Correlation. Four sediment samples were collected within system #33. In general, there were no trends established between locations 33A, 33B, and 33C. However, upgradient location 33D did show elevated concentrations of TPH and inorganic compounds, specifically, arsenic, chromium, cobalt, nickel, lead, and zinc. Sample point 33D is located immediately downstream of Building 2517, which has SA 43K and AREE 61O associated with it. While it is unlikely that contamination reached the storm sewer system from the removed underground storage tank, investigated as SA 43K, runoff from the motor pool activities at AREE 61O may have contributed contamination to the storm sewer system.

4.2.9 System #9 - Isolated Elevated Analyte

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #9 had outliers for one semivolatile organic compound and one pesticide in sediment: pyrene and DDT. It also exhibited outliers in water for arsenic and total pesticides.

When the data printout by analyte parameter and concentration is consulted, system #9 has the highest concentration in sediment for endrin ketone (which has not been plotted on a graph).

As noted in Section 3.9, system #9 has been surrounded by a railyard to the north and east since 1942. There was also a lumber yard, blacksmith shop, and dispatch office in the center of system #9 that have been replaced by an electric shop, heating shop, and hazardous waste storage area. The northwestern section of system #9 is occupied by housing units that were originally constructed in the 1950s.

System Trend Analysis and Land Use Correlation. Five sediment samples were collected in system #9. This system drains housing, commercial, and industrial areas. There is one SA and a number of AREEs associated with system #9, however, based upon the contaminants detected in system #9 there does not appear to be any correlation between the system and associated SAs and AREEs. Furthermore, based upon a review of the contaminants detected in the system, there does not appear to be any distinct contaminant trend. The outliers detected for pyrene and DDT at location 9D are unexplained since this location is adjacent to the Buena Vista Housing area.

Two surface water sample locations were collected within system #9, one at the outfall (9A) and one upstream (9B). In general, there was no trend, however, the upgradient location had higher concentrations for TPH, aluminum, lead, and zinc. This is most likely attributed to the fact that sample 9B was collected in standing water and may have accumulated water from road runoff.

4.2.10 System #12 - Isolated Elevated Analyte

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #12 had outliers for two pesticides in sediment, DDD and DDT. There were no water samples taken at system #12.

When the data printout by analyte parameter and concentration is consulted, system #12 does not have the highest concentration for any additional compounds (which have not been plotted on graphs). However, upon reviewing the data, system #12 has slightly elevated concentrations of other pesticides, including DDE and total pesticides.

As noted in Section 3.12, historical land use near system #12 includes a DEH maintenance facility used in conjunction with the railroad and tracks that ran along the western side of the structure. Building 242 was a fire station in the 1940s and was later converted into a gasoline station and maintenance building. Current land use includes the roads and railways maintenance building.

System Trend Analysis and Land Use Correlation. Four sediment samples were collected within system #12. Sample point 12C, which is located adjacent to SA 33, 34, and 35 and AREEs 61AB and 61A, indicated elevated concentrations of TPH and DDD. This may be attributed to the DPW maintenance facility and the pesticide shops (AREE 61AB, 61A, and SA 33, 34, 35). No other contaminant trends were identified. The outlier of DDT at the outfall, location 12A, is most likely attributed to runoff and natural accumulation of DDT in the sediments.

4.2.11 System #20 - Isolated Elevated Analyte

Lognormal Frequency Analysis. System #20 had one outlier for selenium in sediment. No water samples were collected from system #20. It did not have the highest concentration of any analyte in the data set (for analytes not plotted on graphs) sorted by analyte parameter and concentration.

As noted in Section 3.20, historical land use near system #20 includes former gas stations, a car wash, a shopping center, and hospital storage area.

System Trend Analysis and Land Use Correlation. Three sediment samples were collected within system #20. This system is a large system draining a number of industrial areas. In addition, there are a number of SAs and AREEs associated with system #20. There are no clear contaminant trends identified within the system. System #20 had one outlier for selenium at sample point 20C. The concentration of selenium is low (1.75 µg/g) and there are no clear sources of selenium into this system. All of the associated SAs and AREEs were either vehicle refueling or motor repair operations. Based upon the review of contaminants detected in system #20, there is no indication that these facilities impact this system.

4.2.12 System #21 - Isolated Elevated Analyte

Lognormal Frequency Analysis. System #21 had two outliers in sediment for barium and anthracene. No water samples were collected from system #21. It did not have the highest concentration of any analyte in the data set (for analytes not plotted on graphs) sorted by analyte parameter and concentration.

As noted in Section 3.21, historical land use near system #21 includes open grasslands used for parades.

System Trend Analysis and Land Use Correlation. Four sediment samples were collected within system #21. Sample location 21A had the highest concentrations of polynuclear aromatic hydrocarbons compared to other points within the system. No other clear trends could be identified within the system. AREE 61AW, the Fort Devens fire station, is associated with this system. It is unlikely that the fire station contributes semivolatile organic compounds to the storm sewer. Furthermore, AREE 61AW was determined to require no further action (NFA) in the Draft AREE 61 report because it did not appear that this AREE could impact the environment.

4.2.13 System #25 - Isolated Elevated Analyte

Lognormal Frequency Analysis. The lognormal frequency graphs indicated that system #25 had one metal outlier in sediment for selenium. There were no water

samples taken at system #25. When the data printout by analyte parameter and concentration is consulted, system #25 has the highest concentration in sediment for one analyte, acenaphthylene (which has not been plotted on a graph).

As noted in Section 3.25, historical land use near system #25 includes use as a hospital between 1943 and 1972, after which it was occupied by trailers.

System Trend Analysis and Land Use Correlation. Two sediment samples were collected within system #25. The study conducted as SA 55, investigated an underground storage tank removal, and is the only AOC, SA, or AREE associated with this system. It is unlikely that contaminants from this SA impacted system #25. In general, there is an increasing trend for analyzed compounds at the system's outfall location 25A. However, there is no clear source of contamination associated with system #25.

4.2.14 System #28 - Isolated Elevated Analyte

Lognormal Frequency Analysis. System #28 had one outlier in sediment for perchloroethylene. No water samples were collected from system #28. It had the highest concentration in sediment of dieldrin in the data set (which has not been plotted on graphs) sorted by analyte parameter and concentration.

As noted in Section 3.28, historical land use near system #28 includes wooded areas and housing units.

System Trend Analysis and Land Use Correlation. Four sediment samples were collected within system #28. The most upstream sample, 28D, detected three volatile organic compounds: toluene, 1,3-dichloropropane, and tetrachloroethene. However, the concentrations of these compounds are very low and cannot be readily attributed to any source. Sample location 28C detected chlorobenzene, however, again the concentration is very low and cannot be readily attributed to any known source. Sample point 28B has the highest concentration detected for dieldrin. This is to be expected because this sample point is downgradient from SA 36, a pesticide mixing shop. There were no other trends identified within the system.

4.2.15 System #35 - Isolated Elevated Analyte

Lognormal Frequency Analysis. System #35 had two outliers in sediment for chromium and lead. No water samples were collected from system #35. It did not have the highest concentration of any analyte in the data set (for analytes not plotted on graphs) sorted by analyte and parameter concentration.

As noted in Section 3.35, historical land use near system #35 includes a special forces Motor Repair Facility constructed during the 1960s.

System Trend Analysis and Land Use Correlation. Three sediment samples were collected within system #35. Sample location 35C had an outlier for chromium. Sample location 35B had an outlier for lead. Sample location 35A had the highest concentrations of semivolatile organic compounds as compared to the other sample locations. AREE 61J, an active motor pool, is associated with system #35. All sample locations are downstream of AREE 61J; therefore, metal contamination may be associated with AREE 61J. This AREE is being investigated under the supplemental BRAC EE investigations. No other contaminant trends were identified.

4.2.16 System #37 - Isolated Elevated Analyte

Lognormal Frequency Analysis. System #37 had one outlier in sediment for chromium. The water samples also had one outlier for vanadium. It did not have the highest concentration of any analyte in the data set (for analytes not plotted on graphs) sorted by analyte parameter and concentration.

As noted in Section 3.37, historical land use near system #37 included barracks, playing fields, and grassed and wooded areas.

System Trend Analysis and Land Use Correlation. Four sediment samples were collected within system #37. In general, sample location 37D had the highest concentrations of metals and semivolatile organic compounds as compared to other sample locations within the system. In addition, this sample location had the outlier for chromium. This sample point is upstream of any commercial and industrial operations. Active motor repair operations (i.e., SAs and AREEs) are located downstream of this sample point. Associated upstream AREEs, including historical motor repair and refueling operations, are most likely not contributing any contamination either. However, semivolatile organic compounds and metal concentrations detected in sample 37D are near the detection limit and considered not to be of concern for this system.

Two surface water samples were collected at the system's outfall (37A and 37B). Sample 37B detected trichloroethene, however, the concentration is very low. This sample point is downstream of SA 43H and SA 43I, which is undergoing a removal action. No other distinct trends were identified.

4.3 The Airfield - Systems #41 through #55 at the North Post

4.3.1 Lognormal Frequency Analysis

Due to the unique and consistent history and land use of the airfield, these storm sewer systems have been grouped together. The plot graphs provided at the end of this section (Figures 4-1 through 4-27) include the airfield data. On the plot graphs that detail the semivolatile organic concentrations, the North Post data have been plotted on a separate scale on the same graphs. The semivolatile organic compounds are separated to help illustrate the relative concentrations of these compounds. Semivolatile organic compounds were detected in each system at the airfield. These compounds are most likely the degradation products of jet fuel combustion and would be expected to be found in the storm sewer sediments. The North Post data are represented by line drawn squares on the semivolatile organic compound graphs.

Systems #42, #46, #47, #51, and #53 had neither outliers nor highest concentration levels of any compounds sorted by analyte parameter and concentration. The outfall to system #55 was not found and there was no sediment available for sampling within the system. Systems #41, #43, #44, #45, #48, #49, #50, #52, and #54 had outliers. The compounds identified as outliers at the airfield were barium; selenium; vanadium; benzene; 1,1,1-trichloroethane; 1,1,2,2-tetrachloroethene; anthracene; phenanthrene; and pyrene. Table 4-3 correlates system numbers with sediment and water outliers at the airfield. Compounds noted as highest concentrations of analytes (which have not been plotted on graphs) in the airfield systems include: bromoform; acenaphthylene; fluorene; naphthalene; 2-methylnaphthalene; and boron.

4.3.2 System Trend Analysis and Land Use Correlation

In general, the contaminants detected at the airfield are consistent with the type of contaminants expected at airfield operations. The concentrations of metals detected in Systems #41, #43, #45 and #54 are low and cannot be readily attributed to a specific source. In addition, the concentrations of anthracene, phenanthrene, and pyrene are low and are not most likely residuals from the combustion of jet fuel. In addition, the concentrations of naphthalene and 2-methylnapthalene detected as the highest concentrations in sediment further support the conclusion that the semivolatile organic compounds are most likely residuals of jet fuel combustion. The volatile organic compounds, 1,1,1-trichloroethane and 1,1,2,2-tetrachloroethane, cannot be attributed to a specific source. In addition, systems #44, #45, #48, and #49 do not have any AOCs, SAs, or AREEs associated with them. As a result, these compounds may be attributed to runoff from airfield operations.

A number of AOCs, SAs, and AREEs are at the airfield and are associated with the storm sewer systems. These AREEs and SAs, however, are either being investigated under supplemental investigations or would not impact the storm sewer system. There

are three SAs and one AREE associated with the airfield systems. AREE 61Y, the hangars, have drains that discharge to the sanitary sewer system. In addition, the storm sewers had low concentrations of TPH, a typical indicator of motor repair contamination. The studies conducted as SA 50 and SA 31 investigated fueling and fire training sites. Some of the contaminants detected in the storm sewers may be attributable to these SAs (e.g., PAHs). However, fueling and fire training operations no longer occur at the airfield and these SAs have been identified and are being studied. The study conducted as SA-47 investigated an underground storage tank removal and it is unlikely that there is a correlation between SA 47 and the storm sewer systems at the airfield.

4.4 Correlation Between Storm Sewer Systems and AOCs, SAs, and AREEs

This section presents a comparison of the storm sewer systems with associated AOCs, SAs, and AREEs. As previously discussed in Section 3.0, those AOCs, SAs, and AREEs that either have a direct discharge or could affect a storm sewer from indirect or overland flow were considered to be associated with a storm sewer system. This determination was made by reviewing topographic maps, site and system inspections, and knowledge of the physical setting at Fort Devens. The following discussion is based upon a qualitative review of the contaminants (outliers) detected in each storm sewer system and their relation, if any, to potential contaminants that may be potentially contributed from the associated AOCs, SAs, and AREEs. In addition, the contaminants detected in each storm sewer system were qualitatively reviewed to determine whether there is any correlation between the contaminants detected and the past or present operations at the AOCs, SAs, or AREEs. The historical and present operations at each AOC, SA, and AREE were reviewed to determine whether the operations could potentially contribute contaminants to the storm sewer system.

Each system and the correlation of contaminants from associated AOCs, SAs, and AREEs are discussed below. These associations are provided in Table 3-0.

System #1 and #2

There are no AOCs, SAs, or AREEs associated with systems #1 and #2.

System #3 and #4

- SA 38: This SA was affiliated with battery disposal operations. Chromium was detected as an outlier in sediment and lead as an outlier in water. These outliers, however, did not occur in elevated concentrations nor did the metals indicate a contaminant trend that could be associated with battery disposal activities.

- AOCs 44 and 52: System #3 had a number of semivolatile organic carbon compound outliers and some analytes that are the highest concentrations detected. These compounds may be attributable to AOCs 44 and 52.

- AREE 61B: The floor drains in AREE 61B (Building 3773) are either plugged or flow to the sanitary sewer. Some petroleum runoff may be attributable to vehicle storage and operations at AREE 61B, which could contribute to the semivolatile organic compound outliers. The semivolatile organic carbon outliers are most likely attributable to other sources (e.g., the Massachusetts Army National Guard operations) that drain into system #3.

- AREE 61 AU: Some petroleum runoff may be attributable to vehicle storage and operations at AREE 61AU, which could contribute to the semivolatile organic compound outliers.

- AREE 61X: It is unlikely that AREE 61X directly affects systems #3 and #4 because the floor drains lead to the sanitary sewer system.

- AREE 69AU: This spill site was determined to be NFA in the Draft Past Spill Report (AREE 69) and is unlikely to be contributing contaminants to the storm sewer system.

System #5

- AOCs 44 and 52: System #5 had more outliers for metals than for semivolatile organic compounds. AOCs 44 and 52 would likely contribute semivolatile organic compounds rather than metals to the storm drain. It is unlikely that AOCs 44 and 52 directly impacts system #5, however, the outlier for pyrene may be correlated with AOCs 44 and 52.

System #6

- SA 38: This SA was affiliated with battery disposal operations. Lead, arsenic, and chromium were detected as outliers in sediment. The lead outlier in sediment may be attributable to SA 38.

- SA 57: The TPH concentration of 5,300 ppm in the sediment at the outfall of system #6 may be indicative of residual affects from the spill studied as SA 57.

- AREE 61X: It is unlikely that AREE 61X directly affects system #6 because the floor drains in Building 3713 lead to the sanitary sewer system.

- AREE 61AA: This AREE is the old commissary parking lot. The TPH concentration of 5,300 ppm in the sediment at the outfall of system #6 may be indicative of runoff from this parking lot.

- AREE 69AN: This AREE was determined to be NFA. It is unlikely there is any correlation between this spill that occurred behind Building 3713 and contaminants in system #6.

- AREEs 69AS and 69AT: These spills occurred at Buildings 3713 and 3712. Due to the small amount released in these spills unlikely that residual affects from these spills could be detected in system #6. It is more likely that residual effects from the spill studied as SA 57 would be detected because the spill studied as SA 57 released more petroleum compounds to the system.

System #7 and #8
There are no AOCs, SAs, or AREEs associated with systems #7 and #8.

System #9

- SA 29: There were no PCBs detected in system #9, therefore it is unlikely that there is any correlation between SA 29 and system #9.

- AREE 61D: This AREE is a newly constructed building with drains connected to the sanitary sewer. It is unlikely that there is a correlation between contaminants detected in system #9 and AREE 61D.

- AREE 61AV: This AREE is the electrical and heating shop. It is unlikely that there is a correlation between contaminants detected in system #9 and AREE 61AV.

- AREE 61AX: This AREE is the new commissary parking lot. The contaminants detected in system #9 do not indicate that the oil/water separator in the parking lot is malfunctioning. It is unlikely that there is a correlation between contaminants detected in system #9 and AREE 61AX.

- AREE 61AY: This AREE is the old reservoir fuel area. These tanks have been empty for a number of years. It is unlikely that there is a correlation between contaminants detected in system #9 and AREE 61AY.

- AREE 63F: This AREE is an underground storage tank removal. It was determined to be NFA based upon the tank removal report. It is unlikely that there is a correlation between contaminants detected in system #9 and AREE 63F.

- AREE 69S: This AREE was deleted from the AREE 69 study because the PCB oil spill was investigated as part of SA 29. There were no PCBs detected in system #9, therefore, it is unlikely that there is any correlation between SA 29 and system #9.

System #10

- AREE 61E and 69O: AREE 61E is the large motor pool located on Saratoga Street (104th transportation motor pool). AREE 69O was an asphalt spill at this motor pool. There were no elevated concentrations of contaminants detected at the outfall. The higher TPH concentration and metals concentrations were detected before the oil water separator. These contaminants are potentially indicative of motor maintenance facilities and of the asphalt spill (AREE 69O). However, there is no indication that these contaminants migrated downstream to the outfall and there are no contaminant outliers within system #10.

System #11

- AREE 61BD: This AREE is the DRMO contractor's yard. System #11 had pesticides and volatile organic carbon compounds detected as outliers. These outliers may be attributable to the DRMO operations and coal storage at AREE 61BD.

System #12

- SA 33, 34, and 35: The pesticides detected in sediments sampled in system #12 correlate with the historical pesticide shops investigated as SAs 33, 34, and 35.

- AREE 61AB: This AREE is the Roads and Railroads maintenance shop. The TPH concentration of 7,600 ppm in sediment at sample point 12C may be indicative of the Roads and Railroads maintenance shop activities. However, TPH concentrations detected in system #12 are not determined to be outliers.

- AREE 61A: This AREE is the DEH storage area. The TPH concentrations detected may be indicative of DEH operations. However, TPH concentrations detected in system #12 are not determined to be outliers.

- AREE 61AD: This AREE is the DEH maintenance shop for small engine repair. This AREE was designated as an NFA site in the AREE 61 study. It is unlikely that this repair shop impacted system #12.

- AREEs 63A and 63B: These AREEs were underground storage tank removals. It is unlikely that contaminants from these tanks reached the storm sewer system.

- AREE 69W: This AREE investigated a fuel oil overfill at the elementary school. It is unlikely that given the location of the fuel oil tank that the overfill affected the storm sewer system.

System #13

This system was eliminated from this study because it is joined with system #12.

System #14

- SA 48: There does not appear to be any correlation between the contaminants detected in system #14 and SA 48. The study conducted as SA 48 investigated a leaking underground storage tank. It is unlikely that contaminants associated with this SA reached the storm sewer system.

- AREE 61Z: AREE 61Z includes Building 202 and the surrounding area. Runoff from this building would flow into the outfall of system #14 (sample point 14C). Because Building 202 is a historical motor pool, there is a potential that operations at this site affected system #14. However, the concentrations of contaminants detected are relatively low, therefore identifying a specific source is difficult.

- AREE 61AC: This AREE investigated a building temporarily storing lead paint. The paint was stored indoors. There is no indication that runoff from AREE 61AC affected system #14.

- AREE 61AE: This AREE is an historical barrack. This AREE was determined to be NFA in the Draft AREE 61 report. There is no indication that this empty barrack impacted system #14.

- AREE 61BE: This AREE is a open parking area. This AREE was determined to be NFA in the Draft AREE 61 report. There is no indication that this AREE impacted system #14.

- AREE 61D: This AREE is a newly constructed medical storage warehouse. This AREE was determined to be to be NFA in the Draft AREE 61 report. There is no indication that this AREE impacted system #14.

- AREEs 69AD and 69AI: AREE 69AD was a spill of 100 gallons of diesel fuel. AREE 61AI was a spill of 25 to 30 gallons of diesel fuel. A review of these spills indicated that the petroleum compounds did not reach a storm sewer system. As a result, there is no indication that these AREEs impacted system #14.

System #15

- AREE 61AY: This AREE is the old reservoir fuel area. These tanks have been empty for a number of years. It is unlikely that there is a correlation between contaminants detected in system #15 and AREE 61AY.

System #16

There are no AOCs, SAs, or AREEs associated with system #16.

System #17

- SA16: SA16 is the Shoppette Landfill. SA 16 was not determined to be a dump or landfill and was categorized as NFA. Therefore, it is unlikely that there is a correlation between SA 16 and system #17.

- AOC 40: AOC 40 investigated the Cold Spring Brook landfill and was primarily concerned with metal contamination. There does not appear to be any impact to system #17 because only low concentrations of metals were detected in system #17.

System #18

There are no AOCs, SAs, or AREEs associated with system #18.

System #19

- SA 2: This SA is the incinerator at the veterinary clinic. The incinerator is located in the basement of the clinic. There is no direct impact on the storm sewer due to the physical barrier between the incinerator and the storm sewer system.

- AREE 61BF: This AREE investigated intelligence school operations and was determined to be NFA in the Draft AREE 61 report.

- AREE 61AO: This AREE investigated the incinerator at the veterinary clinic. The incinerator is located in the basement of the clinic. There is no direct impact on the storm sewer due to the physical barrier between the incinerator and the storm sewer system.

- AREE 61AH: This AREE investigated the photographic shop. There was no evidence of spills or releases from this facility. It is unlikely that there is a correlation between AREE 61AH and system #19.

System #20

- SA 43F: This SA investigated an underground storage tank removal. The tank was determined not to be leaking; therefore, it is unlikely that there is an impact from SA 43F on system #20.

- SA 43B and SA 43C: Both SAs were underground storage tank removals that were determined to be NFA. It is unlikely that these tanks impact system #20.

- SA 43D: This SA investigated an underground storage tank removal. It is unlikely that any releases from SA 43D reached system #20.

- AREE 61C: AREE 61C investigated the historical motor pool that was located in the current PX parking lot. This AREE was determined to be to be NFA and

it is unlikely that any releases from the historical motor pool would be detected in the storm sewer system.

- AREE 61AZ: This AREE investigated the POV car wash at Fort Devens. This operation discharges to the sanitary sewer and it is unlikely that there is any impact on the storm sewer system.

- AREE 61AQ: Further investigations indicated that AREE 61AQ was investigated as part of SA 43B. SA 43B was an underground storage tank removal that was determined to be NFA. Therefore, it is unlikely that there is an impact from AREE 61AQ on system #20.

- AREE 61AI: AREE 61AI is the auto craft shop at Fort Devens. There is a potential for runoff from this AREE to impact the storm sewer system. However, system #20 did not have any outliers for TPH and only one outlier for selenium in sediment. Therefore, it is unlikely that AREE 61AI contributes substantial amounts of contaminants to system #20.

- AREE 61AR: AREE 61AR was investigated as part of SA 43D. This SA investigated an underground storage tank removal. It is unlikely that any releases from SA 43D reached system #20.

- AREE 61F: This AREE was a historical motor pool. It is unlikely that any releases from the historical motor pool would be detected in the storm sewer system.

System #21

- AREE 61AW: This AREE investigated the Fort Devens Fire Station. This AREE was determined to be NFA in the Draft AREE 61 report. System #21 is recommended for additional sampling because of isolated elevated analytes and for one polynuclear aromatic compound (anthracene) and barium. It is unlikely that AREE 61AW is contributing these contaminants to the system.

- AREE 69R: This AREE investigated a past spill of PCBs. There were no PCBs detected in system #21; therefore, there is no correlation between AREE 69R and system #21.

System #22

- AREE 61AK: AREE 61AK was the photographic facility in Building P-12. This AREE was determined to be NFA in the Draft AREE 61 report because this AREE covered Building P-12, the intelligence school. It is unlikely that there is a correlation between AREE 61AK and system #22.

System #23

- AREEs 61AK and 61AL: AREE 61AK is described above. AREE 61AL is the computer room in the Post Headquarters Building P-3. These AREEs were determined to be to be NFA in the Draft AREE 61 report. These AREEs covered Buildings P-12, the intelligence school and P-3, the post headquarters. It is unlikely that there is a correlation between these AREEs.

System #24

- AREE 61N: This AREE is the Test Measurement and Diagnostic (TMDE) building and was determined to be NFA in the Draft AREE 61 report. It is unlikely that there is a correlation between AREE 61N and system #24.

System #25

- SA 55: SA 55 addressed an underground storage tank removal. Based upon the analytes detected in system #25 it is unlikely that SA 55 impacts system #25. In addition, it is unlikely that any releases from the previously removed underground storage tanks would be detected in the storm drain system.

System #26

- SA 58: SA 58 addressed an underground storage tank removal. Based upon the analytes detected in system #26 it is unlikely that SA 58 impacts system #26. In addition, it is unlikely that any releases from the previously removed underground storage tanks would be detected in the storm drain system.

- AREE 61Q: AREE 61Q investigated an historical gas station on Lake George Street. Given the low concentrations of analytes detected in system #26, it is unlikely that AREE 61Q impacts system #26. Furthermore, it is unlikely that any releases from the historical motor pool would be detected in the storm sewer system.

- AREE 63Y, 63AJ, 63AI, 63AG: All of these AREEs investigated previously removed underground storage tanks. The analytes detected are not in high enough concentrations in system #26 to indicate any contamination from the USTs. In addition, it is unlikely that any releases from the previously removed underground storage tanks would be detected in the storm sewer system.

- AREE 69B: AREE 69B investigated a petroleum spill from an fuel tank at Building 2602. It is unlikely that there is any residual contamination in the storm sewer system from the spill.

System #27

- SA 43S: SA 43S investigated an historical gas station. If SA 43S impacted the storm sewer system, TPH and related indications of petroleum compounds would be detected. The analytes detected in system #27 do not indicate any

impact from this historical gas station on system #27. Furthermore, it is unlikely that any releases from the historical motor pool would be detected in the storm sewer system since the motor pool was demolished over 20 years ago.

- SA 51: SA 51 investigated the high voltage electronic testing and repair operations at this site. The analytes detected in system #27 do not indicate levels of petroleum and solvent contaminants that would be expected from this operation. Therefore, there is no correlation between SA 51 and the contaminants detected in system #27.

- AREE 61BB: AREE 61BB investigated the maintenance operations at the O'Neill Building. This site was determined to be NFA in the Draft AREE 61 report. It is unlikely that there is a correlation between AREE 61BB and system #27.

- AREE 61V: This AREE investigated historical motor pool operations. The analytes detected in system #27 do not indicate any impact from motor pool operations on system #27. Furthermore, it is unlikely that any releases from the historical motor pool would be detected in the storm sewer system.

- AREE 61BC: This AREE investigated an intelligence school. This site was determined to be NFA in the Draft AREE 61 report. It is unlikely that there is a correlation between AREE 61BB and system #27.

- AREE 69F: This site was investigated as part of SA 51. Refer to the discussion regarding SA 51 above.

System #28

- SA 43P: This SA investigated an historical motor pool. The contaminants detected in system #28 do not indicate any impact from motor pool operations on system #28. Furthermore, it is unlikely that any releases from the historical motor pool would be detected in the storm sewer system because of the age of this motor pool.

- SA 36: This SA investigated a pesticide mixing shop. System #28 had the highest detection for dieldrin, which is consistent with the presence of the pesticide mixing shop.

- SA 43O(54): This SA investigated a historical motor pool. The contaminants detected in system #28 do not indicate any impact from motor pool operations on this system. Furthermore, it is unlikely that any releases from the historical motor pool would be detected in the storm sewer system.

- AREE 61T: This AREE is an Army reserves storage building. This site was determined to be NFA in the Draft AREE 61 report. It is unlikely that there is a correlation between the contaminants detected in system #28 and AREE 61T.

- AREE 61S: This AREE investigated the historical motor pool at the site of the current NBC school. The contaminants detected in system #28 do not indicate any impact from motor pool operations on system #28. Furthermore, it is unlikely that any releases from the historical motor pool would be detected in the storm sewer system.

- AREE 61AN: This AREE is the Vail Dental Clinic. The contaminants detected in system #28 do not indicate high levels of metals or contaminants that could be associated with the dental clinic. As a result, there does not appear to be a correlation between AREE 61AN and system #28.

System #29
- SA 10: This SA was determined to be a NFA site because there was no release of contamination at this SA. As a result, there is no correlation between SA 10 and system #29.

System #30
There are no AOCs, SAs, or AREEs associated with system #30.

System #31
There are no AOCs, SAs, or AREEs associated with system #31.

System #32
- SA 1: This SA investigated the Cutler Army Hospital. The low levels of contaminants detected in system #32 do not indicate a correlation between SA 1 and system #32.

- AREE 61AM: This AREE investigated the hospital and was determined to be NFA in the Draft AREE 61 report. As a result, it is unlikely that there is a correlation between AREE 61AM and system #32.

System #33
- SA 43K: This SA investigated an underground storage tank removal. It is unlikely that contamination from this SA reached system #33.

- SA 49: SA 49 investigated the fueling station at Building 3601. A qualitative review of the contaminants detected in system #33 indicated very low concentrations of motor pool contaminants (e.g., TPH, metals, PAHs) downstream of sample point 33D. As a result, it is unlikely that there is a correlation between SA 49 and system #33.

- AREE 61O: This AREE is located at Building 2517 immediately upstream of sample point 33D. This AREE is currently a vehicle maintenance shop. Sample point 33D had the highest concentration of TPH and metals within system #33. There is a potential correlation between AREE 61O and the contaminants detected at sample point 33D.

- AREE 61AM: This AREE investigated the hospital and was determined to be NFA in the Draft AREE 61 report. Because of the nature of contaminants detected in this system it is unlikely that there is a correlation between AREE 61AM and system #33.

- AREE 63AX: This AREE investigated an underground storage tank removal. It is unlikely that contamination from this AREE reached system #33.

System #34

There are no AOCs, SAs, or AREEs associated with system #34.

System #35

- AREE 61J: This AREE investigated a 1960s motor pool. Two sample points 35B and 35C had outliers for lead and chromium. There is a potential that these metals are associated with motor pool operations at AREE 61J. The Draft AREE 61 report recommended this AREE for further investigation to identify potential residual sources of contamination.

System #36

There are two SAs and one AREE associated with system #36. All of these sites have been investigated as part of the Supplemental Site Investigation for SAs 43H and 43I. Please refer to the report for the Supplemental Site Investigations Groups 2,7 for information on these locations. This system was not sampled during the AREE 70 evaluation. This system was sampled as part of the supplemental site investigations.

System #37

- SAs 43H and 43I: These SAs investigated historical gas stations. System #37 did have one outlier for chromium, however, a qualitative review of the contaminants detected in system #37 indicated generally low concentrations of motor pool contaminants (e.g., TPH, metals, PAHs) at sample points below these historical gas stations. Therefore, it is unlikely that SAs 43H and 43I are significantly impacting system #37.

- SA43Q: This SA investigated a historical gas station on the site of the current soccer field. It is unlikely that there is any correlation between the current use at SA43Q and any contamination in system #37. In addition, it is unlikely that

residual contamination from this area is present in the storm sewer system since the gas station was destroyed in the 1950s.

- SA43R: This SA investigated a historical gas station on the site of the current soccer field. It is unlikely that there is any correlation between the current use at SA43Q and any contamination in system #37. In addition, it is unlikely that residual contamination from this area is present in the storm sewer system since the gas station was destroyed in the 1950s.

- AREE 61I: This AREE investigated the 1960s motor pool associated with SA 43H and 43I. Please refer to the description provided in the first bullet above.

- AREE 61U: This AREE was an historical motor pool and is currently a soccer field. It is unlikely that there is any correlation between the current use at AREE 61U and any contamination in system #37. In addition, it is unlikely that residual contamination from this area is present in the storm sewer system since the historical motor pool was destroyed in the 1950s.

- AREE 61AT: This AREE was a historical motor pool and is currently an open field. It is unlikely that there is any correlation between the current use at AREE 61U and any contamination found in system #37. In addition, it is unlikely that residual contamination is present in the storm sewer system since the historical motor pool was destroyed in the 1950s.

- AREE 69AV: This AREE investigated a spill at a fuel containment ring. It is unlikely that any contamination reached the storm sewer from this AREE. As a result, there is no probable correlation between AREE 69AV and system #37.

System #38

- SA 43H: This SA investigated an historical gas station. A qualitative review of the contaminants detected in system #38 indicated very low concentrations of motor pool contaminants (e.g., TPH, metals, PAHs). As a result, it is unlikely that there is a correlation between SA 43H and system #38.

- AREE 61H: This AREE investigated the 1960s motor pool at Buildings 617 and 618. A qualitative review of the contaminants detected in system #38 indicated very low concentrations of motor pool contaminants (e.g., TPH, metals, PAHs). As a result, it is unlikely that there is a correlation between AREE 61H and system #38.

- AREE 61I: This AREE investigated the 1960s motor pool associated with SAs 43H and 43I. Please refer to the description provided in the first bullet for system #38.

System #39

- SA 43F: This SA investigated a historical motor pool. A qualitative review of the contaminants detected in system #39 indicated low concentrations of motor pool contaminants (e.g., TPH, metals, PAHs). As a result, it is unlikely that there is a correlation between SA 43F and system #39.

- AREE 61C: This AREE investigated an historical motor pool that occupied the PX. It is unlikely that there is residual contamination from this historical motor pool since the PX has occupied the site since 1975. Furthermore, the Draft AREE 61 report determined this site to be NFA.

- AREE 61AS: This AREE investigated an historical gas station at the current site of the Class VI liquor store. It is unlikely that there is residual contamination from this historical motor pool since the liquor store occupied the site for a number of years. This AREE is undergoing supplemental investigations around a cesspool. However, it is unlikely that contamination from the cesspool reached the storm sewer since there is no indication of a connection between the two structures.

- AREE 61H: This AREE investigated the 1960s motor pool at Buildings 617 and 618. A qualitative review of the contaminants detected in system #39 indicated low concentrations of some motor pool contaminants (e.g., metals, PAHs). However, some of the TPH detected at the outfall (sample point 39A) could be attributed to AREE 61H. This AREE is undergoing supplemental investigations around a cesspool and dry well. However, it is unlikely that contamination from these structures reached the storm sewer since there is no indication of a connection between these structures.

System #40

- AOC 43G: This AOC investigated the AAFES gas station. A qualitative review of the contaminants detected in system #40 indicated low concentrations of motor pool contaminants (e.g., metals, PAHs) and TPH was not detected. As a result, it is unlikely that there is a correlation between AOC 43G and system #40.

- AREE 61G: This AREE also investigated the AAFES gas station. A qualitative review of the contaminants detected in system #40 indicated low concentrations of motor pool contaminants (e.g., metals, PAHs) and TPH was not detected. As

a result, it is unlikely that there is a correlation between AREE 61G and system #40.

- AREE 61AZ: This AREE investigated the POV car wash at Fort Devens. A qualitative review of the contaminants detected in system #40 indicated low concentrations of contaminants typically associated with motor repair operations. In addition, AREE 61AZ was determined to be NFA in the Draft AREE 61 report. As a result, it is unlikely that there is a correlation between AREE 61AZ and system #40.

- AREE 61AI: AREE 61AI investigated the auto craft shop at Fort Devens. A qualitative review of the contaminants detected in system #40 indicated low concentrations of motor pool contaminants (e.g., metals, PAHs) and TPH was not detected. As a result, it is unlikely that there is a correlation between AREE 61AI and system #40.

- AREE 61BA: This AREE investigated a new storage building belonging to a medical support unit. This AREE was determined to be NFA in the Draft AREE 61 report because the operation of this building presents a very low probability of releasing contaminants to the environment. As a result, it is unlikely that this AREE contributes contamination to system #40.

- AREE 69AP: This AREE investigated historical spills at the AAFES gas station. A qualitative review of the contaminants detected in system #40 indicated low concentrations of motor pool contaminants (e.g., metals, PAHs) and TPH was not detected. As a result, it is unlikely that there is a correlation between AREE 69AP and system #40.

System #41

- AREE 61Y: This AREE investigated the airport hangars on the North Post of Fort Devens. All of the drains within these hangars flow to the sanitary sewer system. A qualitative review of the contaminants detected in system #41 indicated low concentrations of aircraft maintenance contaminants (e.g., TPH, metals, PAHs). This AREE was determined to be NFA in the Draft AREE 61 report. As a result, it is unlikely that there is a correlation between AREE 61Y and system #41.

System #42

- SA 50: A qualitative review of the contaminants detected in system #42 did not indicate concentrations of contaminants that would associate SA 50 with system #42. In addition, the concentrations of contaminants detected in system #42 were low concentrations of contaminants typically associated with maintenance

operations (e.g., TPH, metals). As a result, it is unlikely that there is a correlation between AREE SA 50 and system #42.

System #43

- SA 47: This SA investigated an underground storage tank removal. It is unlikely that contamination from an underground storage tank associated with this SA reached system #43. As a result, it is unlikely that there is a correlation between SA 47 and system #43.

- SA 50: This SA investigated contamination resulting from fueling operations at the airfield. A qualitative review of the analytes detected in system #43 indicates a potential correlation between contaminants and the fueling operations. In particular, somewhat elevated concentrations of TPH, and polynuclear aromatic hydrocarbons were detected in system #43. Fueling no longer occurs at SA 50. As a result, it is unlikely that additional contamination will be added to system #43. Furthermore, since fueling no longer occurs, a potential contaminant source is being controlled.

- AREE 61Y: This AREE investigated the airport hangars on the North Post of Fort Devens. All of the drains within these hangars flow to the sanitary sewer system. This AREE was determined to be NFA in the Draft AREE 61 report. As a result, it is unlikely that there is a correlation between AREE 61Y and system #43.

System #44 - System #51

There are no AOCs, SAs, or AREEs associated with systems #44 through #51.

System #52

- SA 31: This SA investigated the fire training area at the airfield. A qualitative review of the analytes detected in system #52 indicates a potential correlation between contaminants detected and the fire training operations. In particular, somewhat elevated concentrations of polynuclear aromatic hydrocarbons were detected in system #52. However, it is difficult to determine whether the source of these contaminants is from the fire training activities or from residuals from the burning of jet fuel (jet wash). Fire training no longer occurs at the airfield. As a result, it is unlikely that additional contamination will be added to system #52. Furthermore, since fire training no longer occurs, a potential contaminant source is being controlled.

System #53

- SA 31: This SA investigated the fire training area at the airfield. Refer to the discussion for system #52 regarding the potential for correlation between system #53 and SA 31.

System #54 and System #55

There are no AOCs, SAs, or AREEs associated with system #54 and system #55.

Figure 4-1 Total Petroleum Hydrocarbons Concentrations in Ground Water

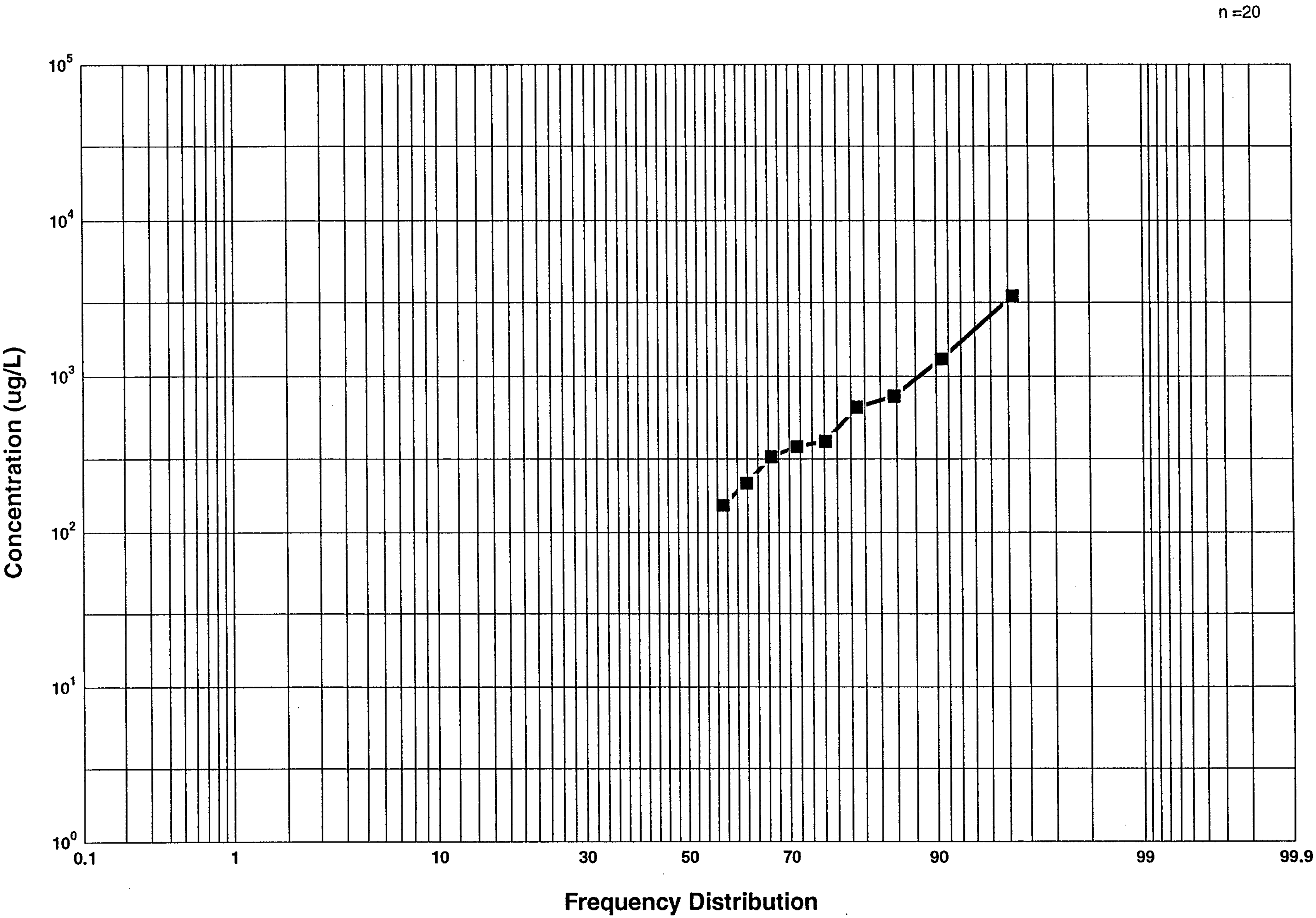


Figure 4-1a Total Petroleum Hydrocarbons Concentrations in Sediment

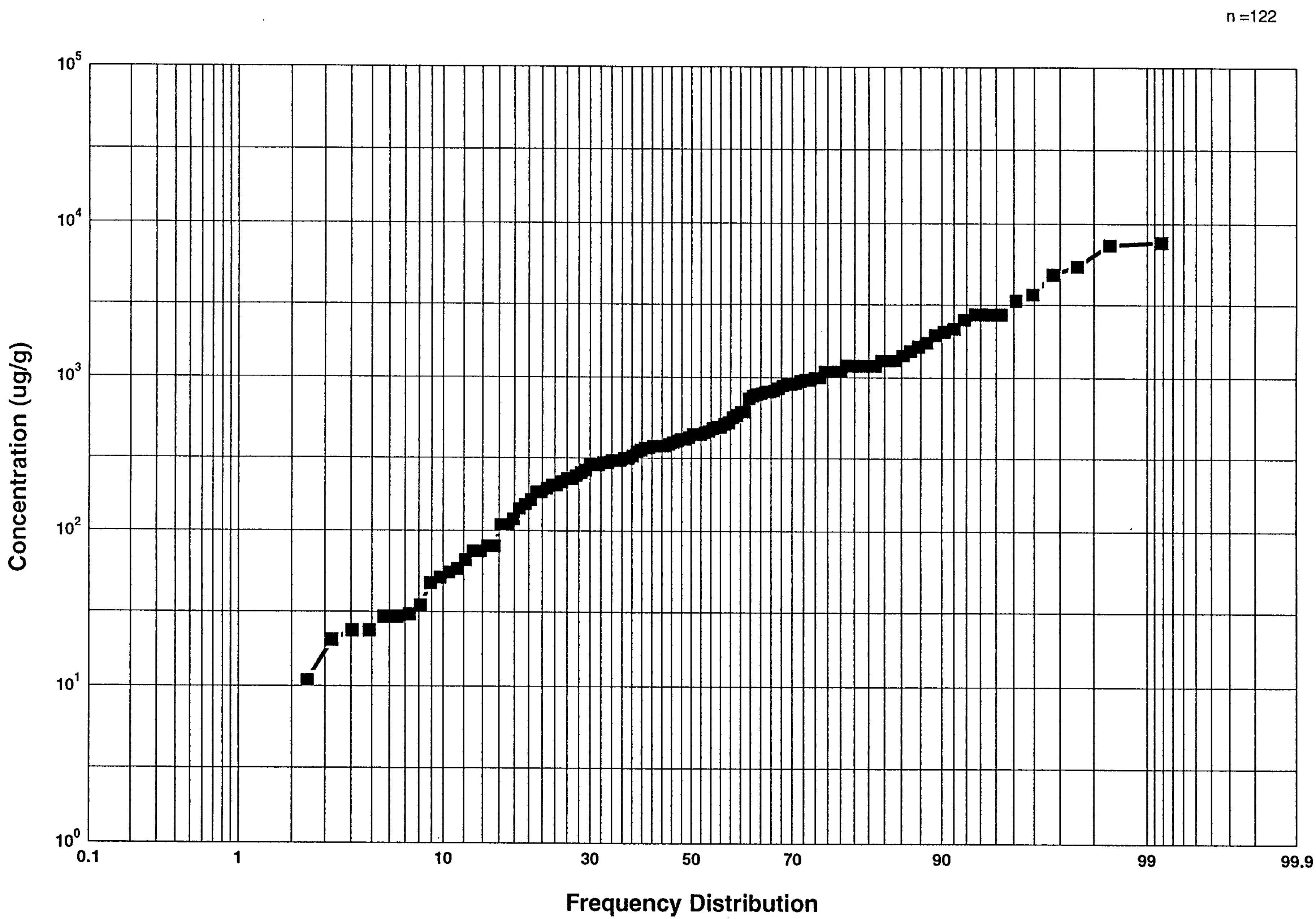
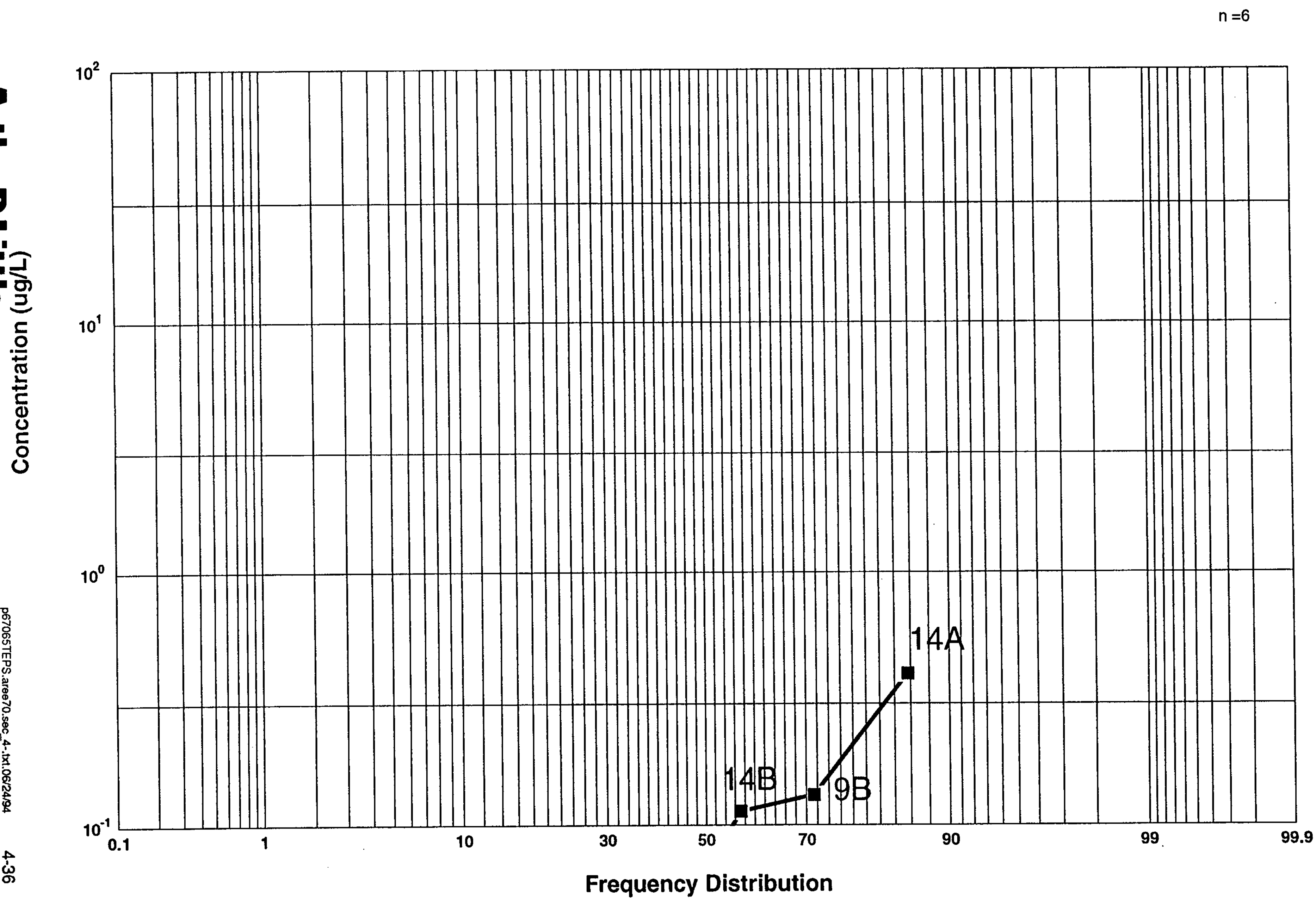
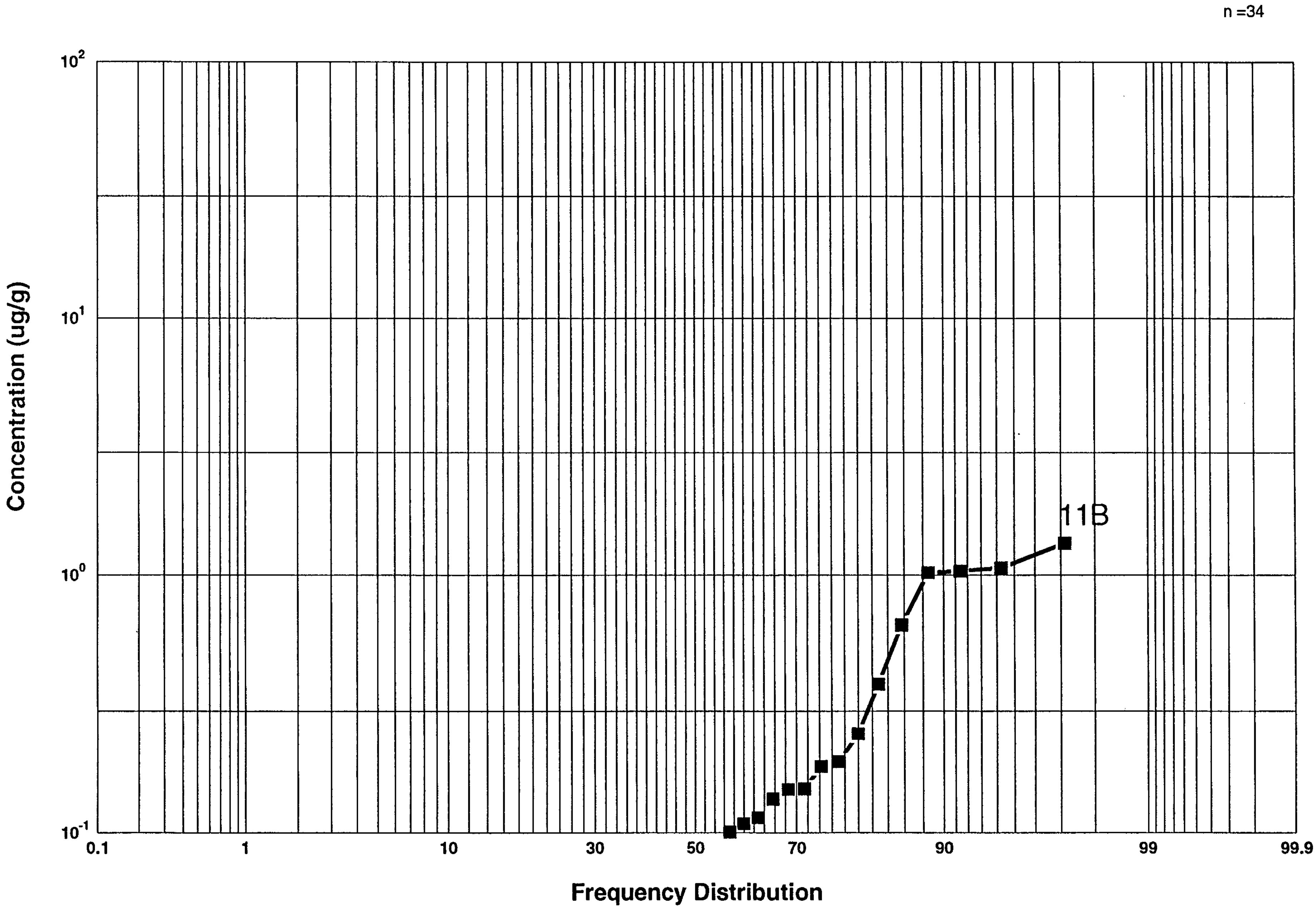


Figure 4-2 Total Pesticides Concentrations in Surface Water



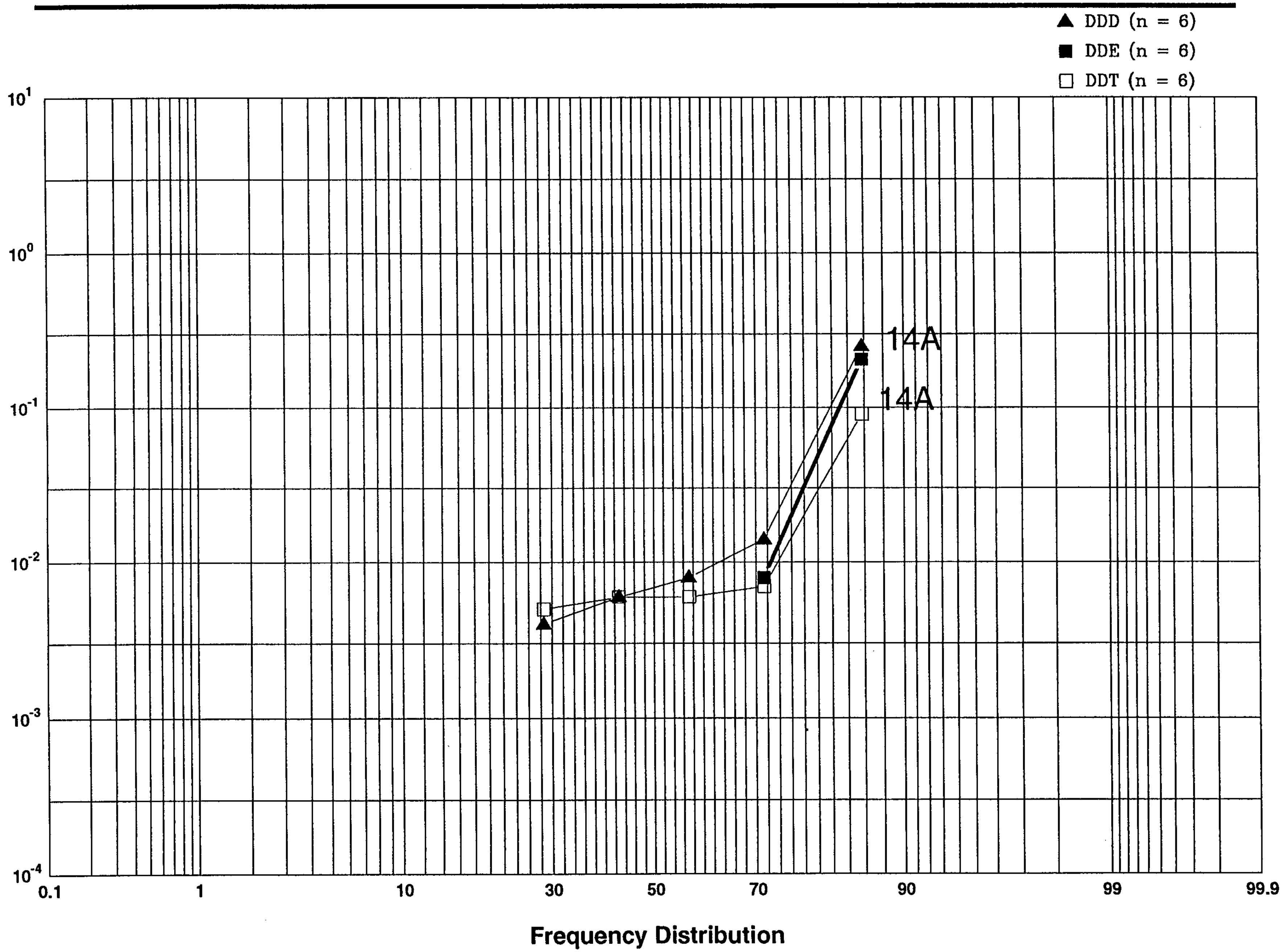
* Annotated points are outliers' system identification code

Figure 4- 2a Total Pesticides Concentrations in Sediment



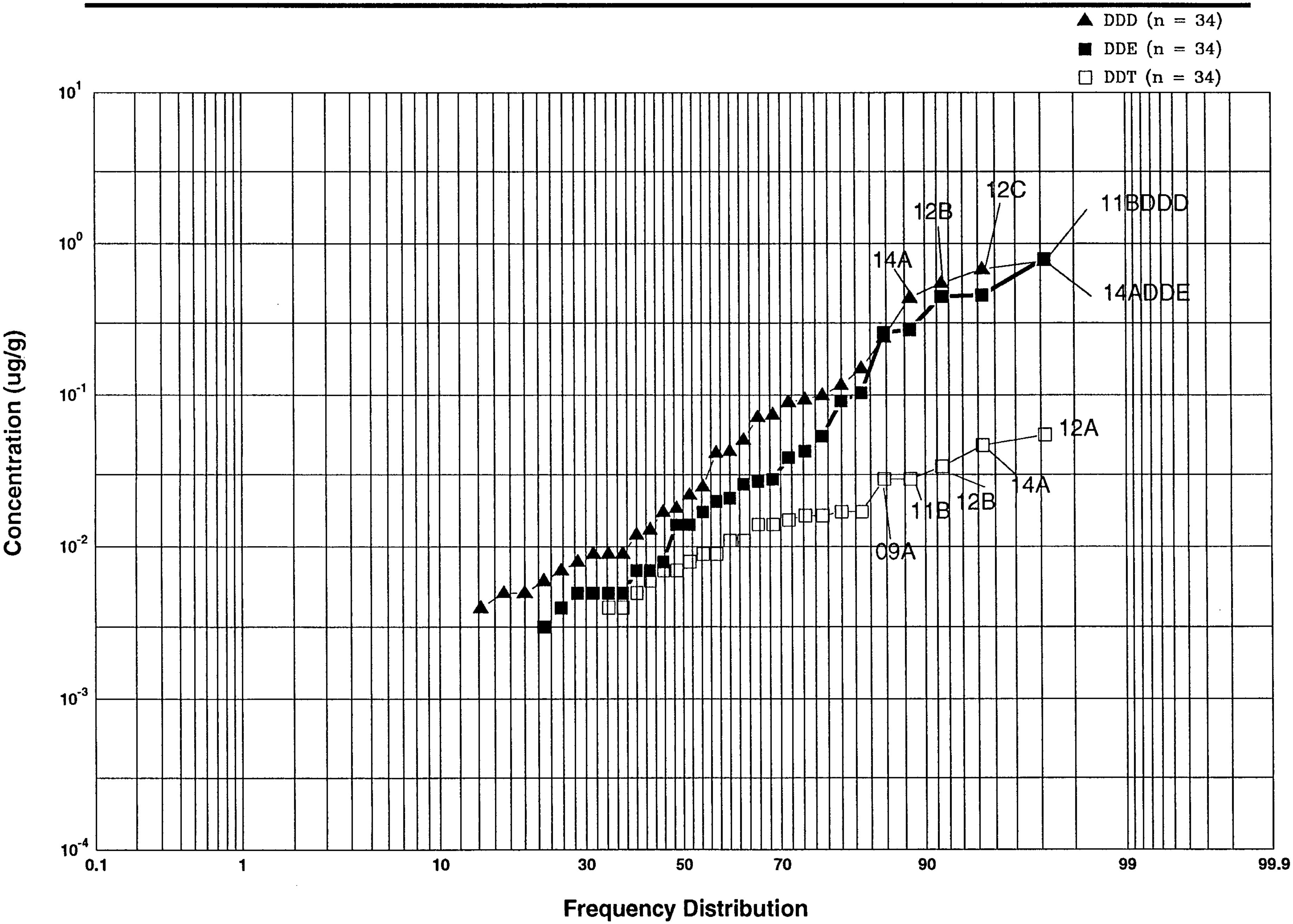
*Annotated point is outlier's system indentification code

Figure 4-3 DDD,DDE,DDT Concentrations in Surface Water



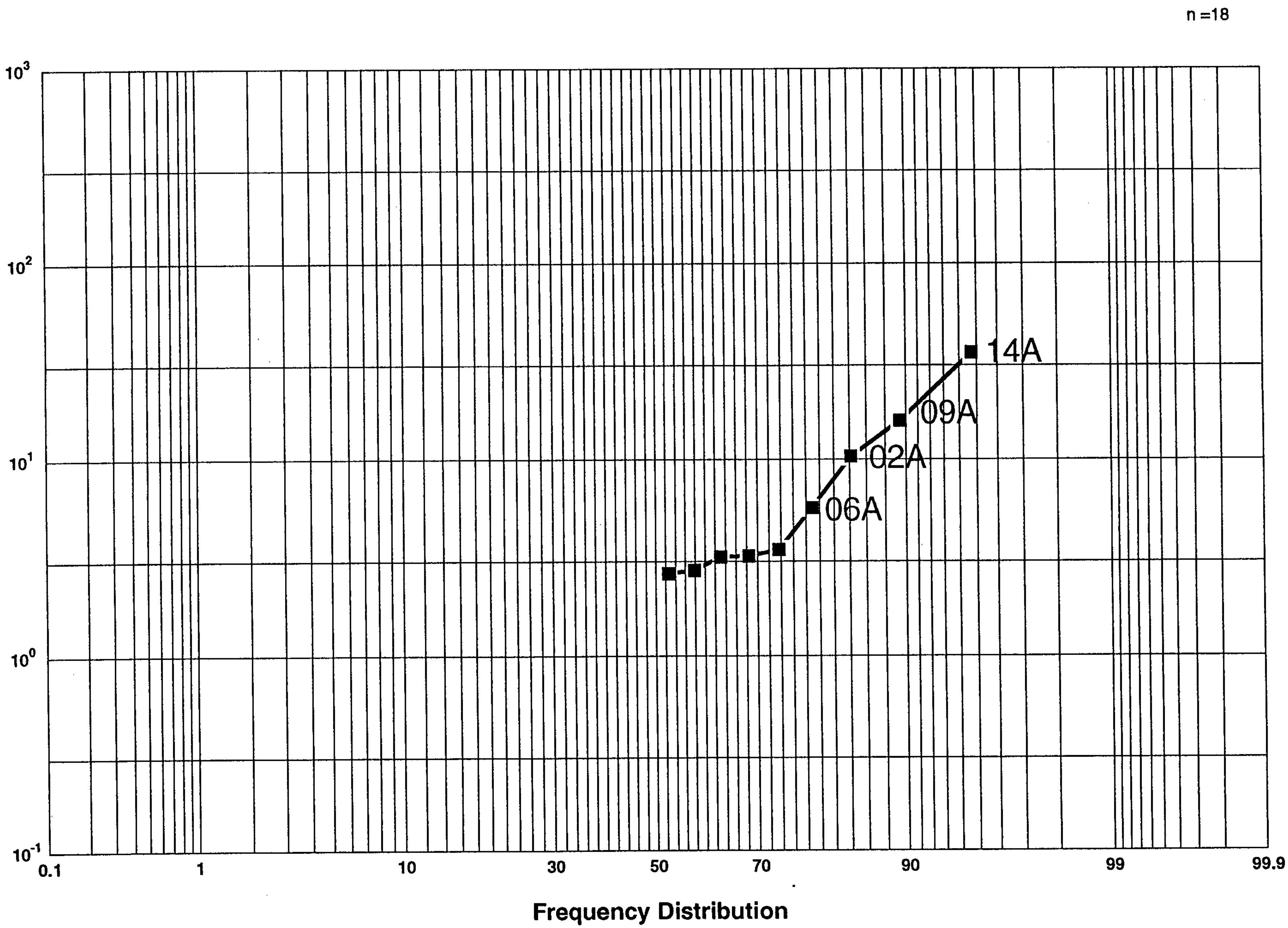
* Annotated points are outliers' system identification codes

Figure 4-3a DDD,DDE,DDT Concentrations in Sediment



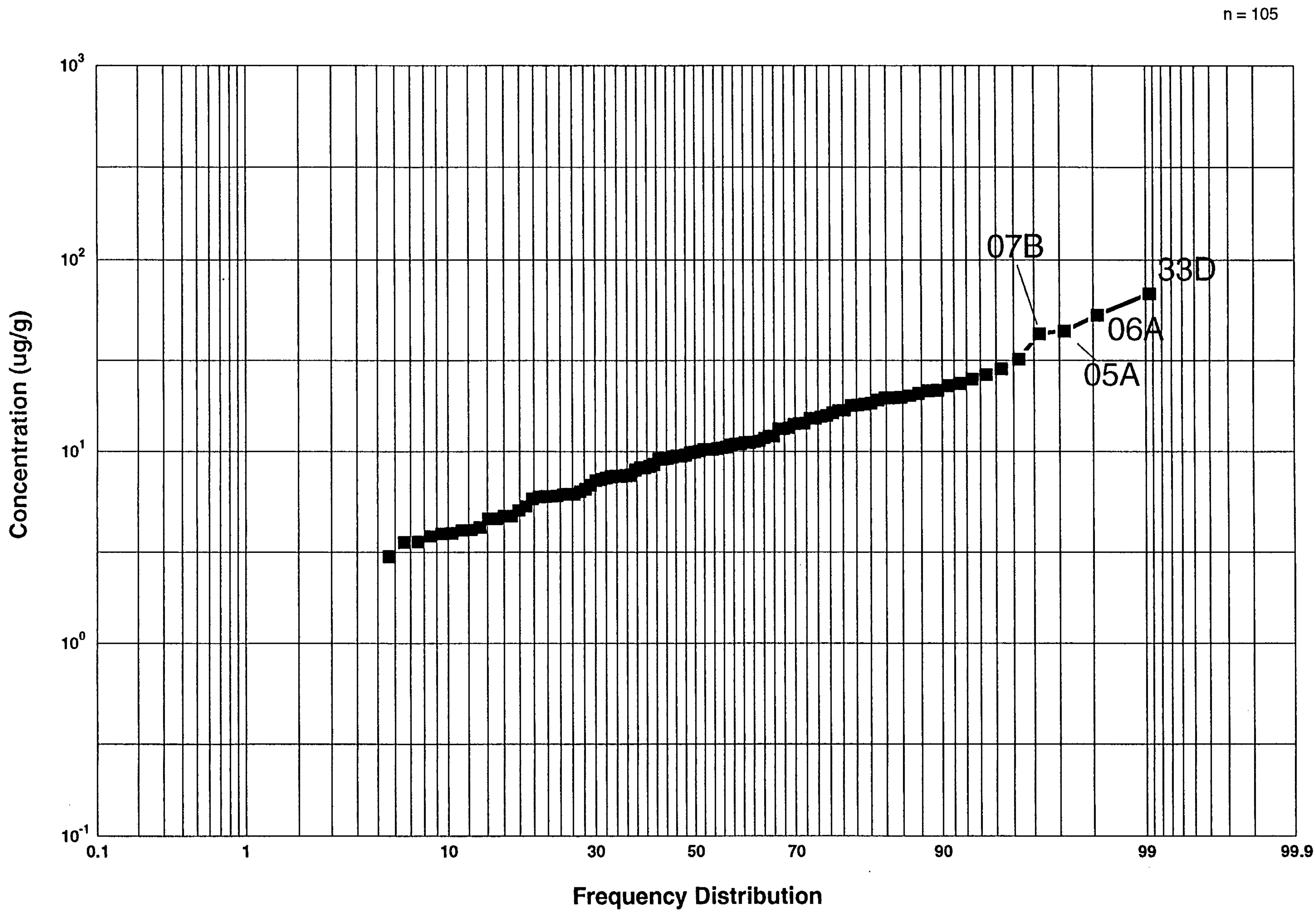
*Annotated points are outliers' system indentification codes

Figure 4-4 Arsenic Concentrations in Surface Water



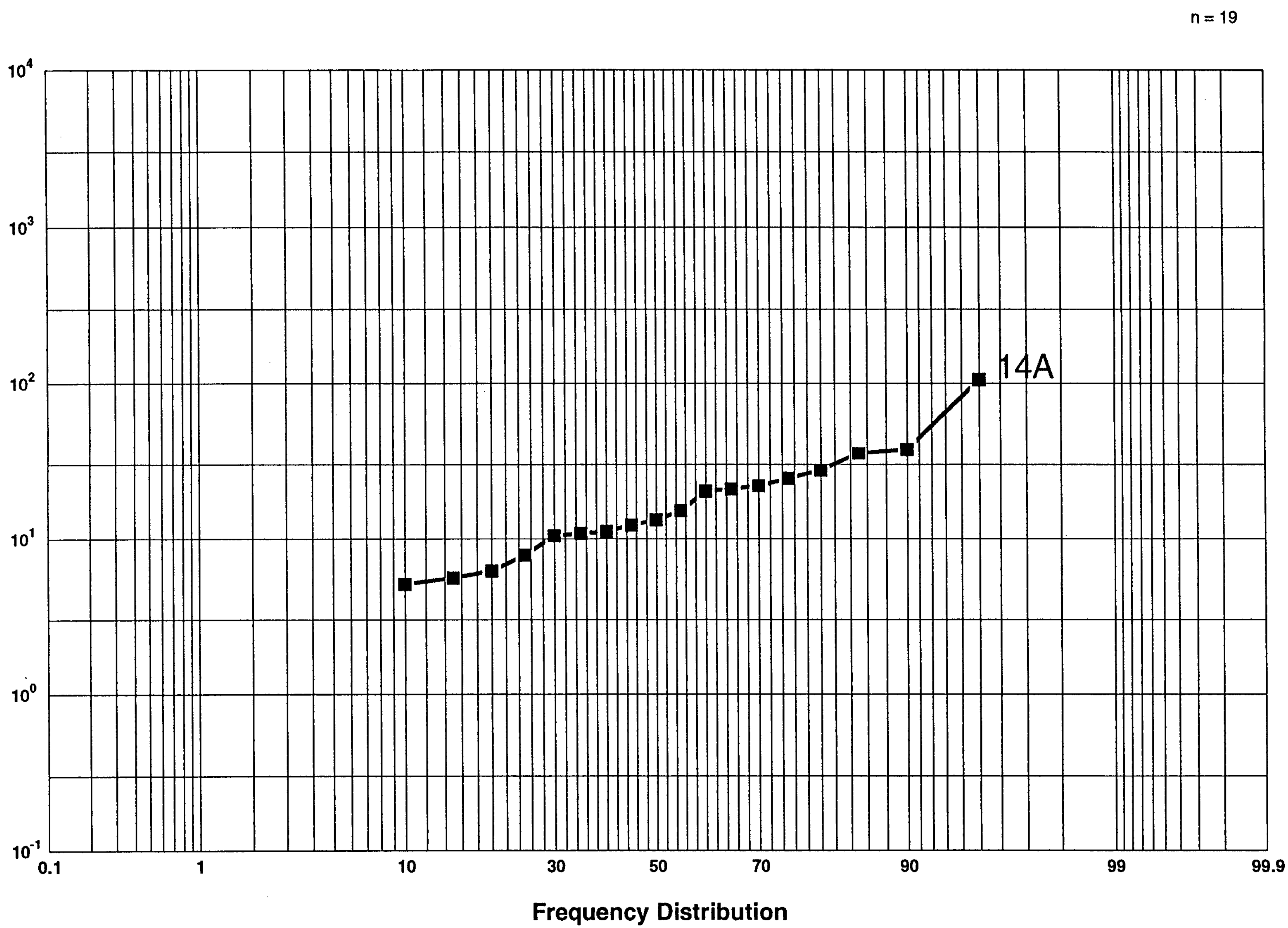
* Annotated points are outliers' system identification code

Figure 4-4a Arsenic Concentrations in Sediment



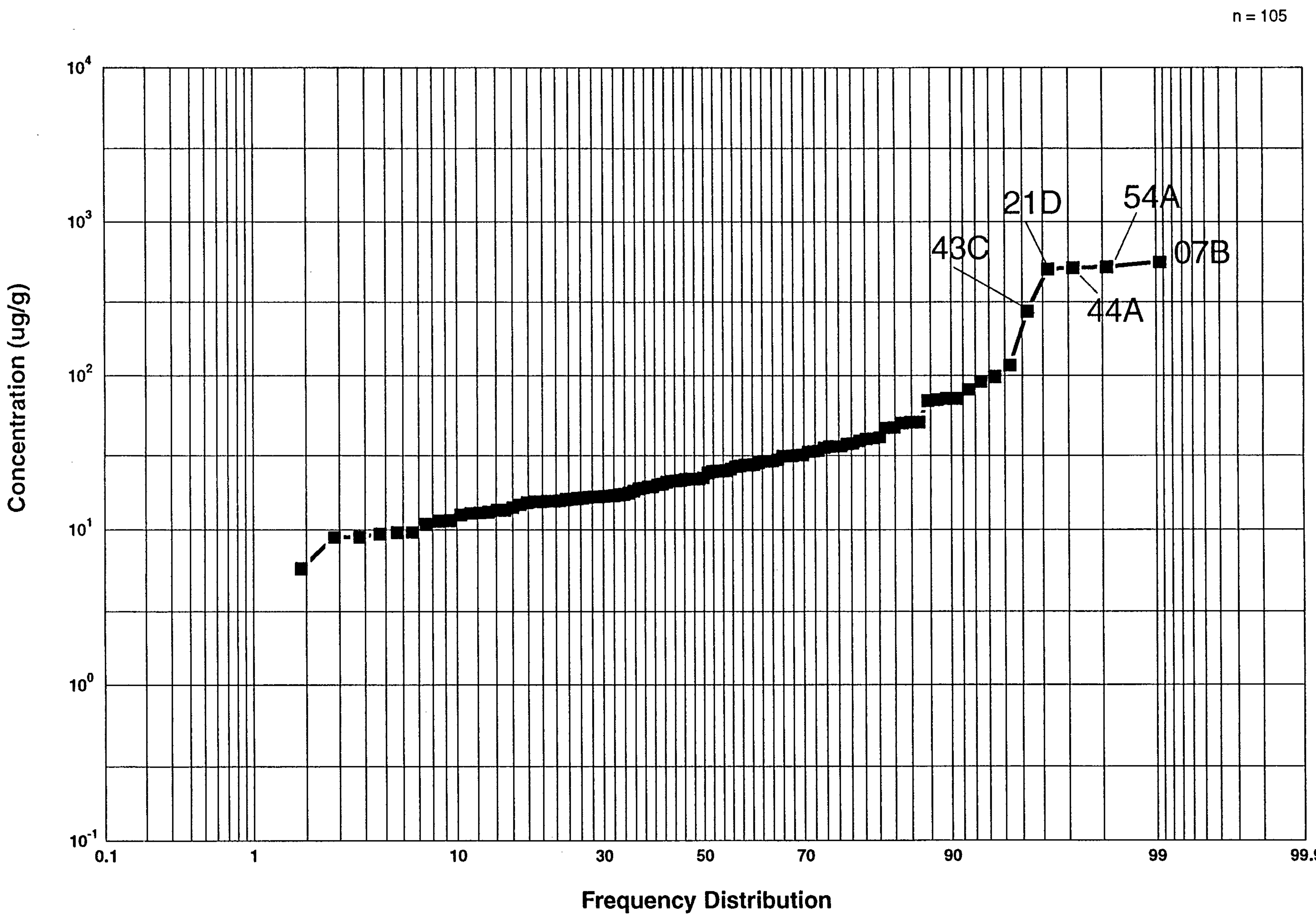
* Annotated points are outliers' system identification codes

Figure 4-5 Barium Concentrations in Surface Water



* Annotated point is outlier's system identification code

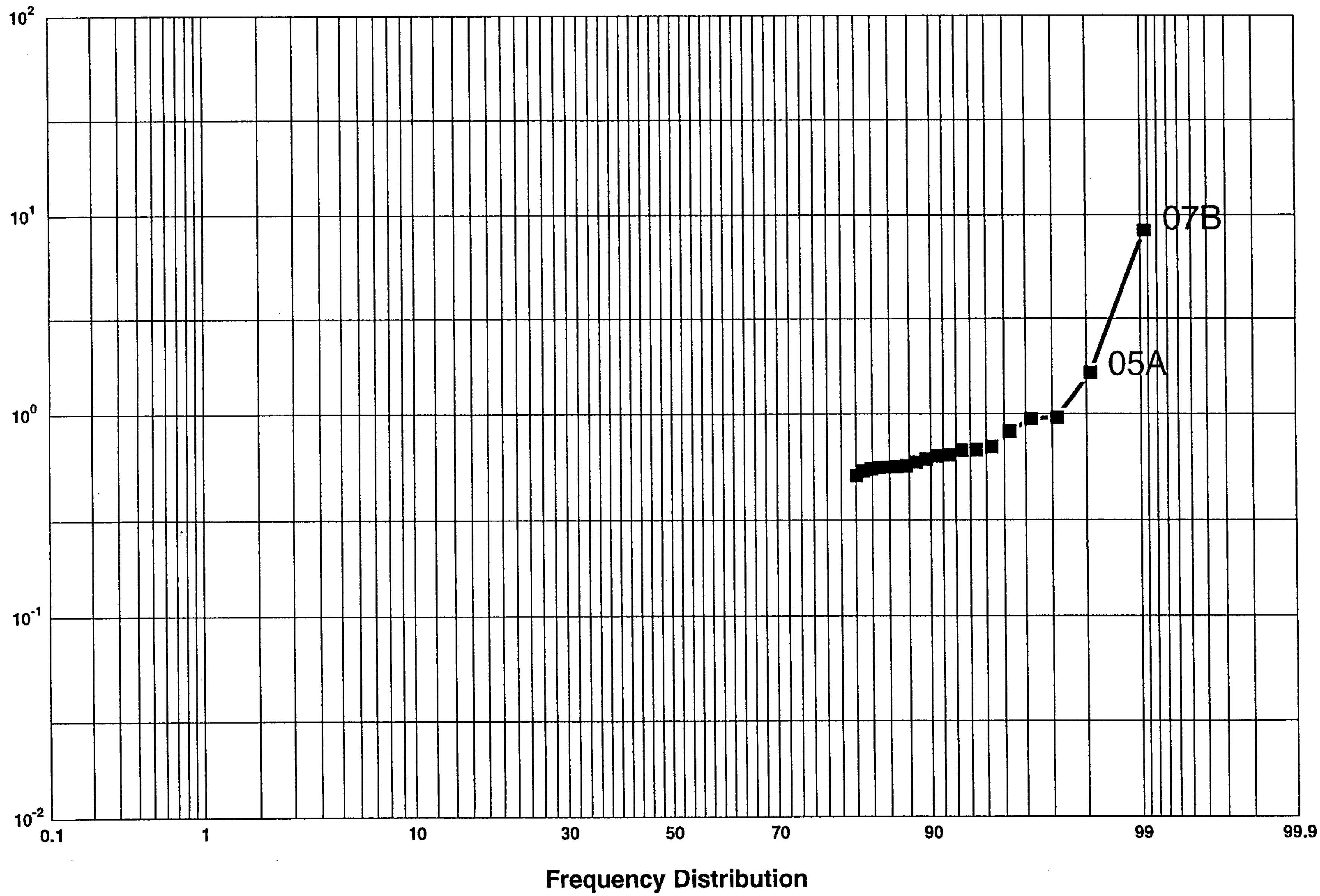
Figure 4-5a Barium Concentrations in Sediment



* Annotated points are outliers' system identification codes

Figure 4-6 Beryllium Concentrations in Sediment

n = 105



* Annotated points are outliers' system identification codes

Figure 4-7 Cadmium Concentrations in Sediment

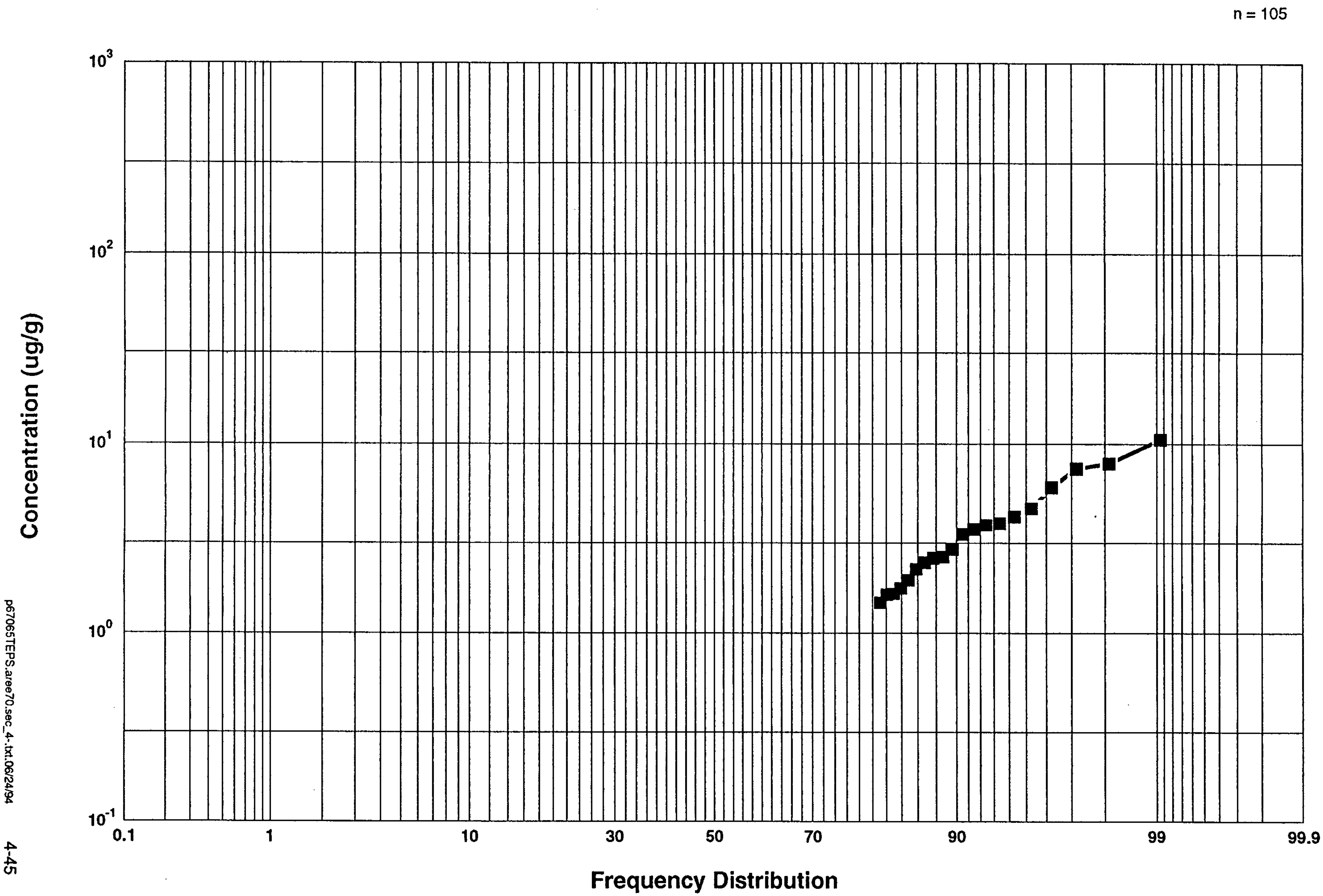
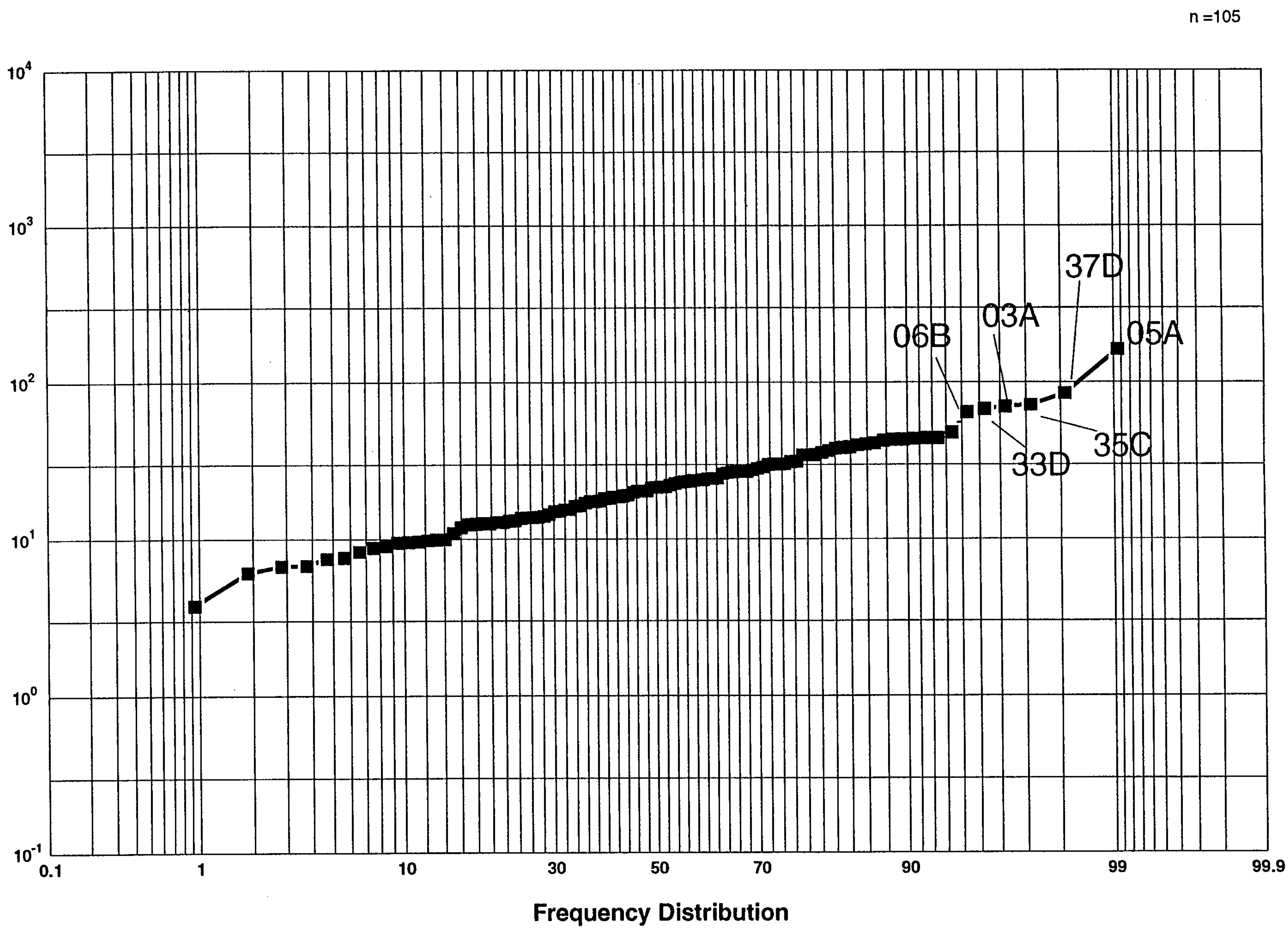
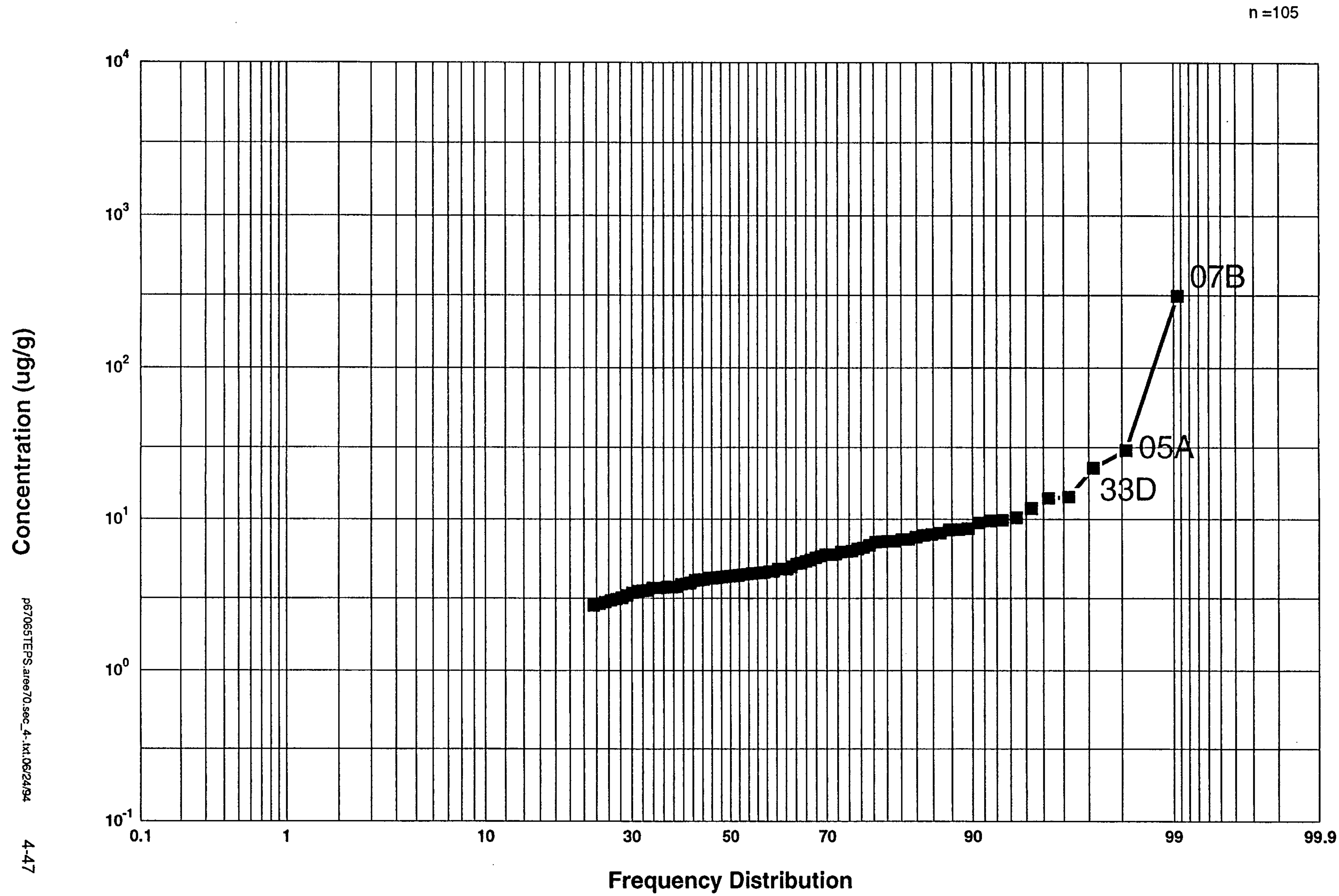


Figure 4-8 Chromium Concentrations in Sediment



* Annotated points are outliers' system identification codes

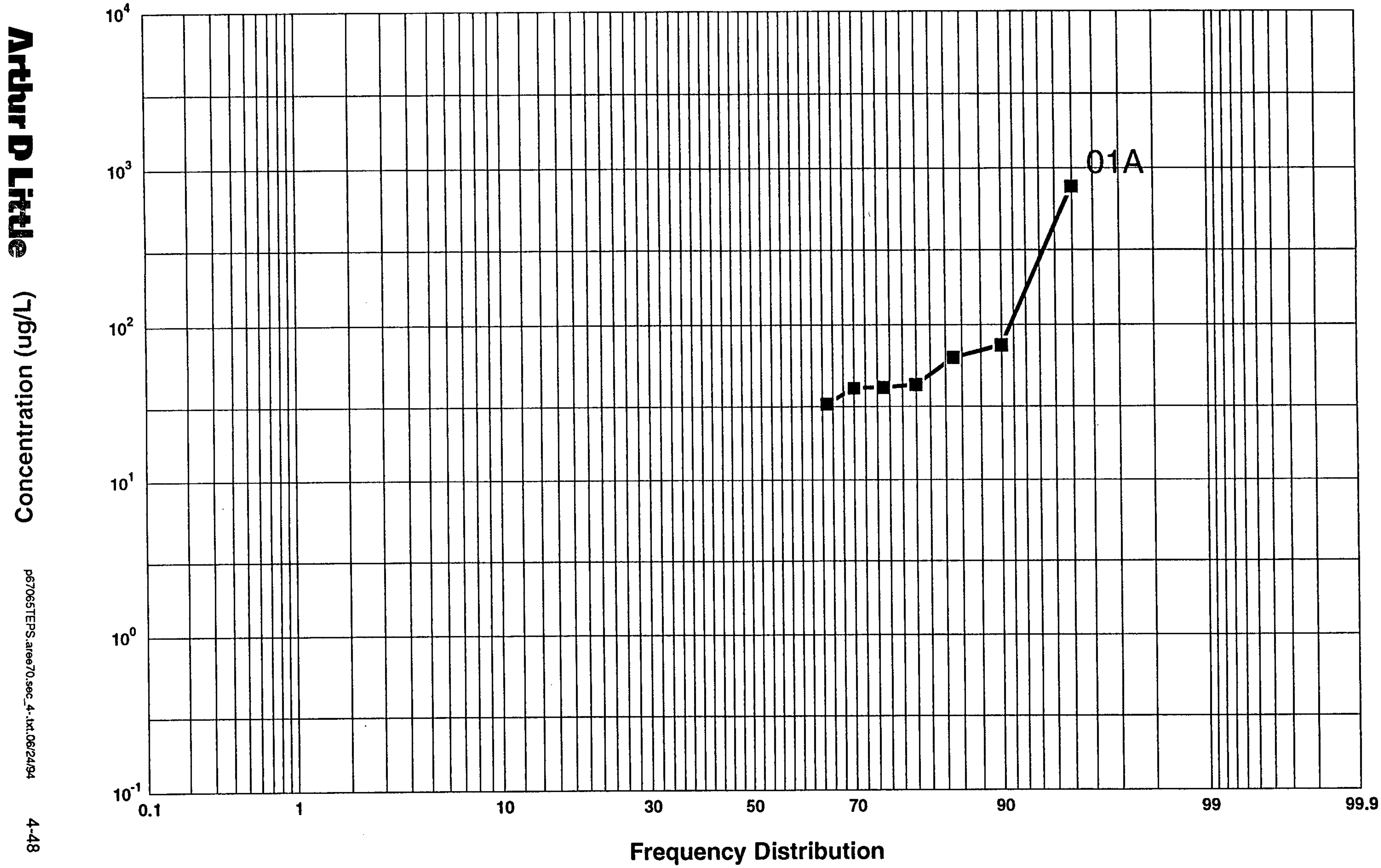
Figure 4-9 Cobalt Concentrations in Sediment



* Annotated points are outliers' system identification codes

Figure 4-10 Copper Concentrations in Surface Water

n =19



* Annotated point is outlier's system identification code

Figure 4-10a Copper Concentrations in Sediment

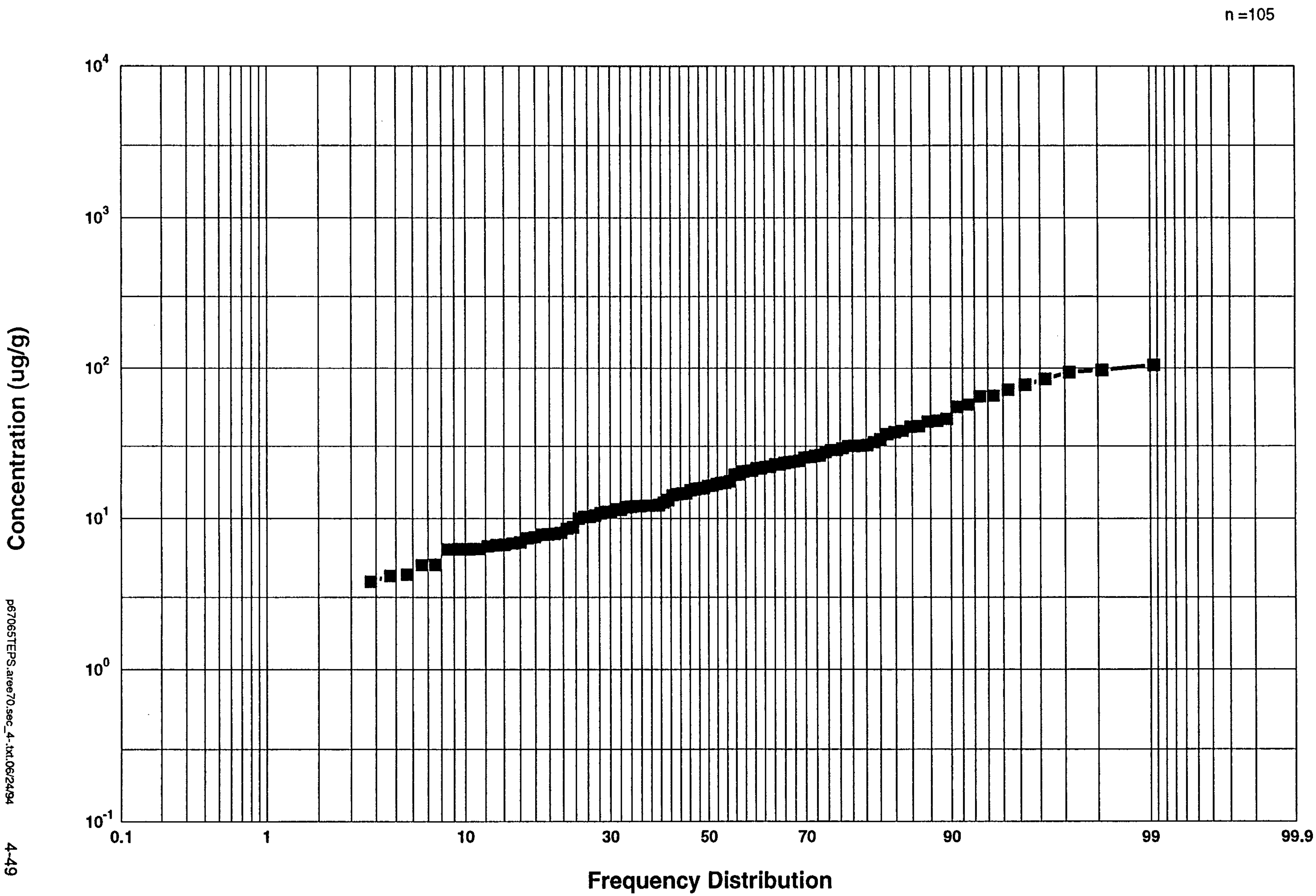
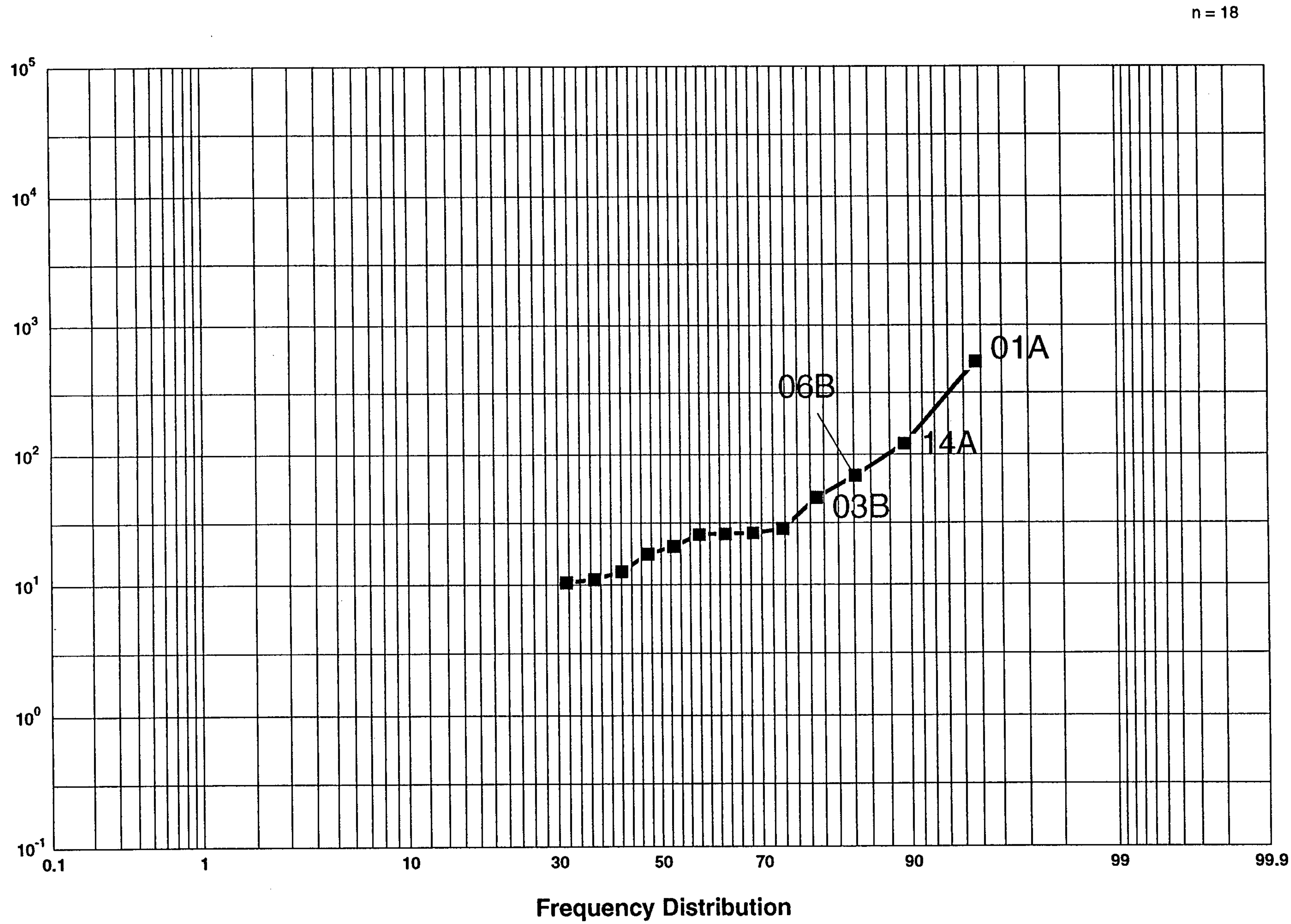
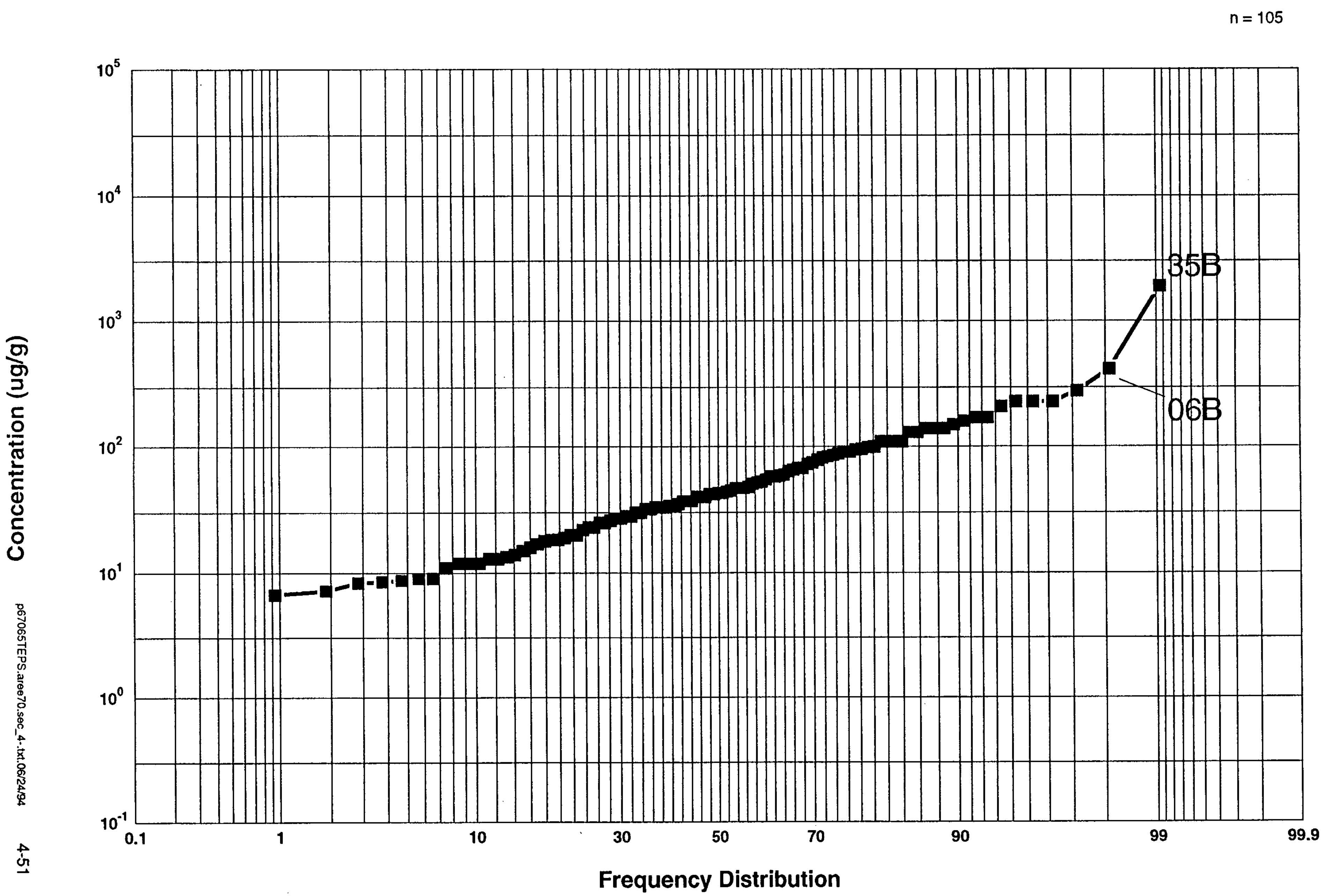


Figure 4-11 Lead Concentrations in Surface Water



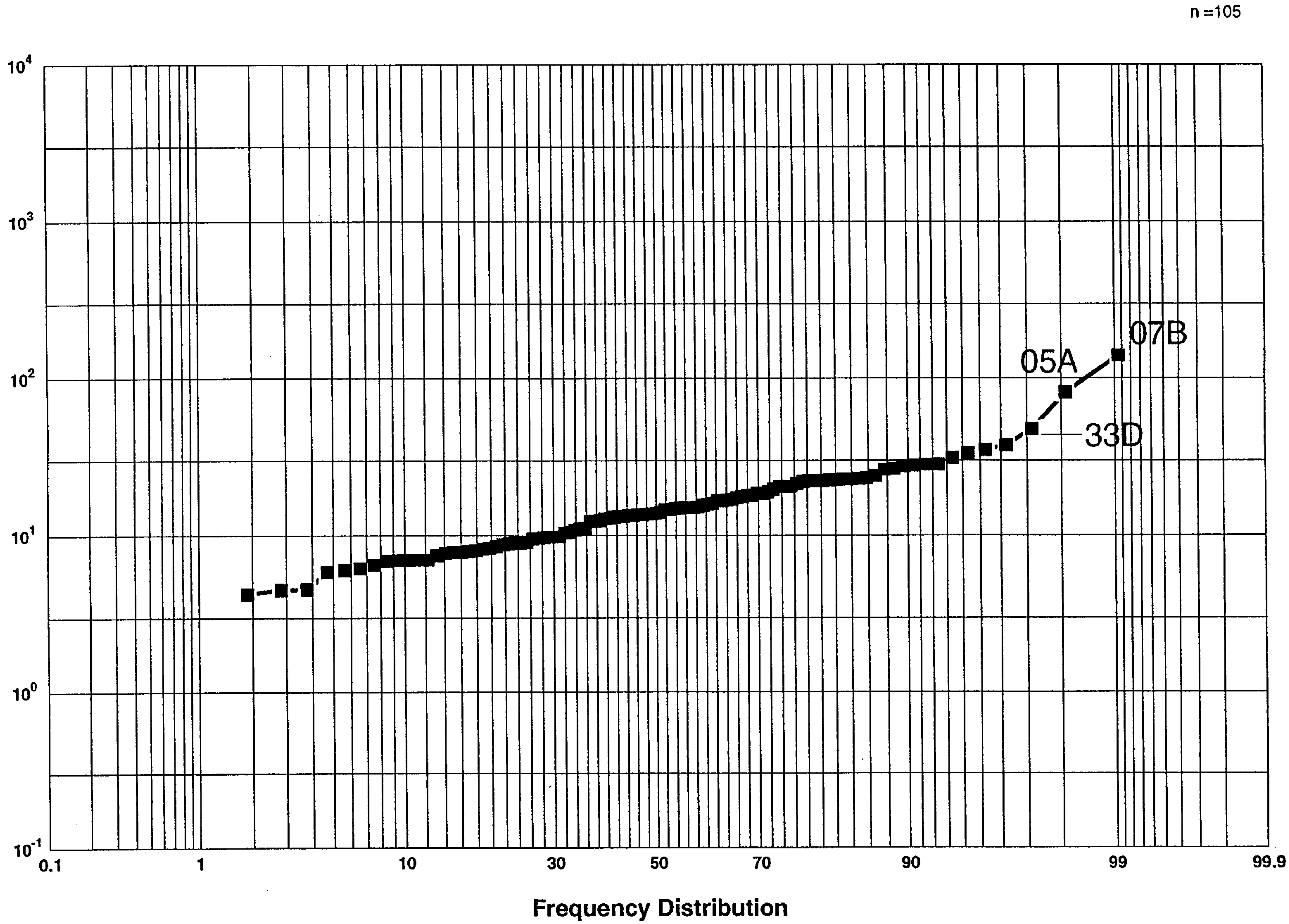
* Annotated points are outliers' system identifcation codes

Figure 4-11a Lead Concentrations in Sediment



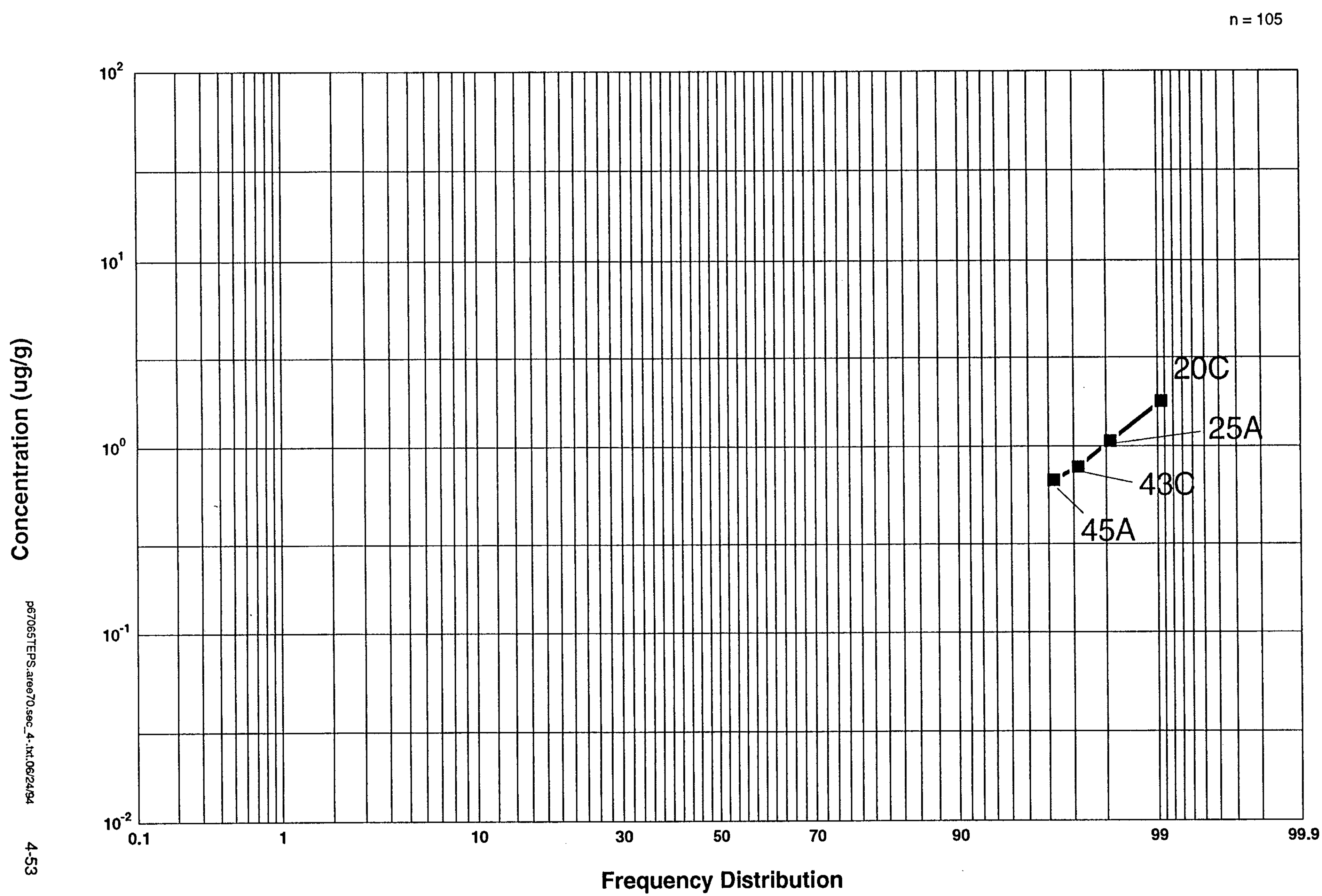
* Annotated points are outliers' system identification codes

Figure 4-12 Nickel Concentrations in Sediment



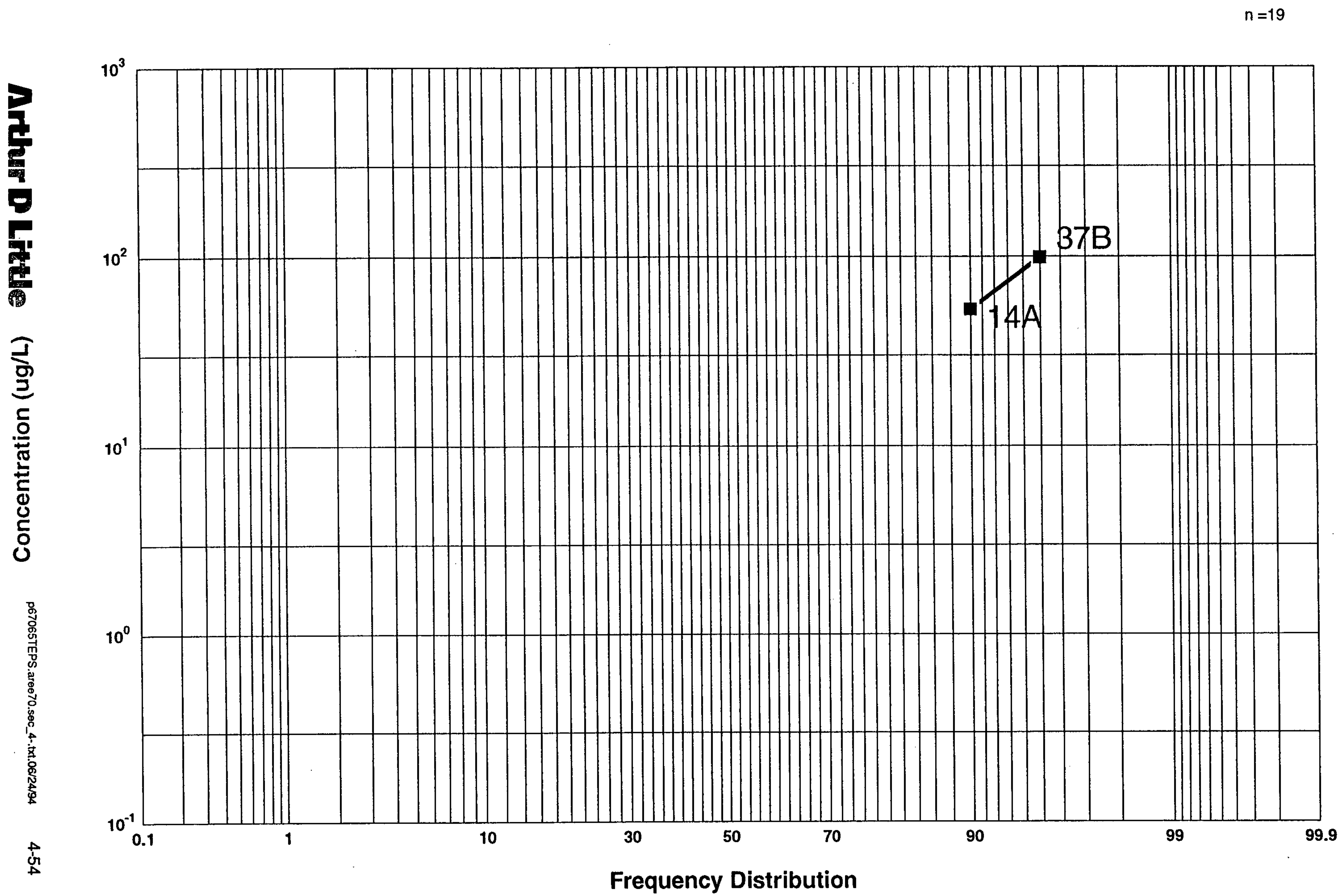
* Annotated points are outliers' system identification codes

Figure 4-13 Selenium Concentrations in Sediment



Annotated points are outliers' system identification codes

Figure 4-14 Vanadium Concentrations in Surface Water



* Annotated points are outliers' system identification codes

Figure 4-14a Vanadium Concentrations in Sediment

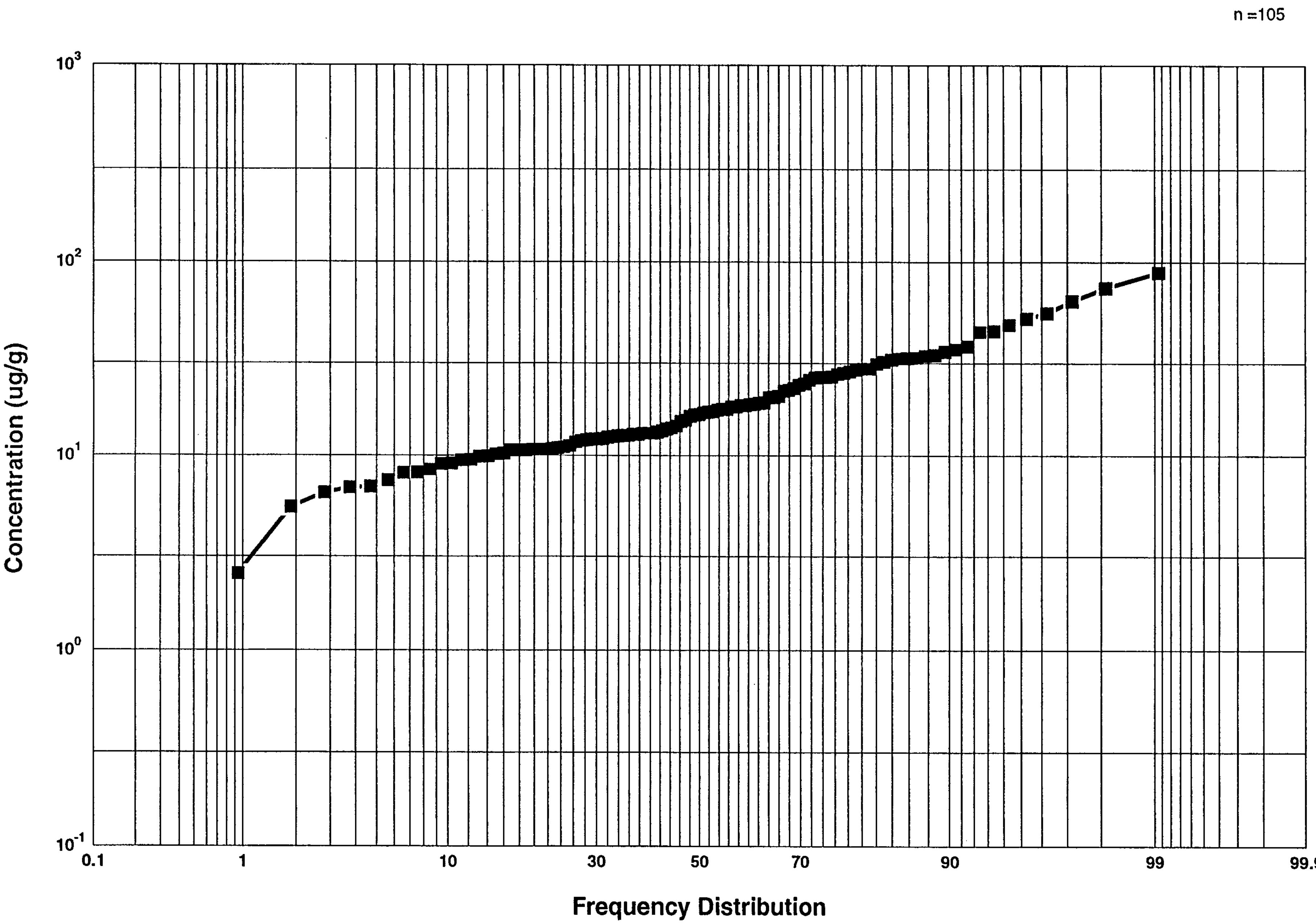


Figure 4-15 Zinc Concentrations in Surface Water

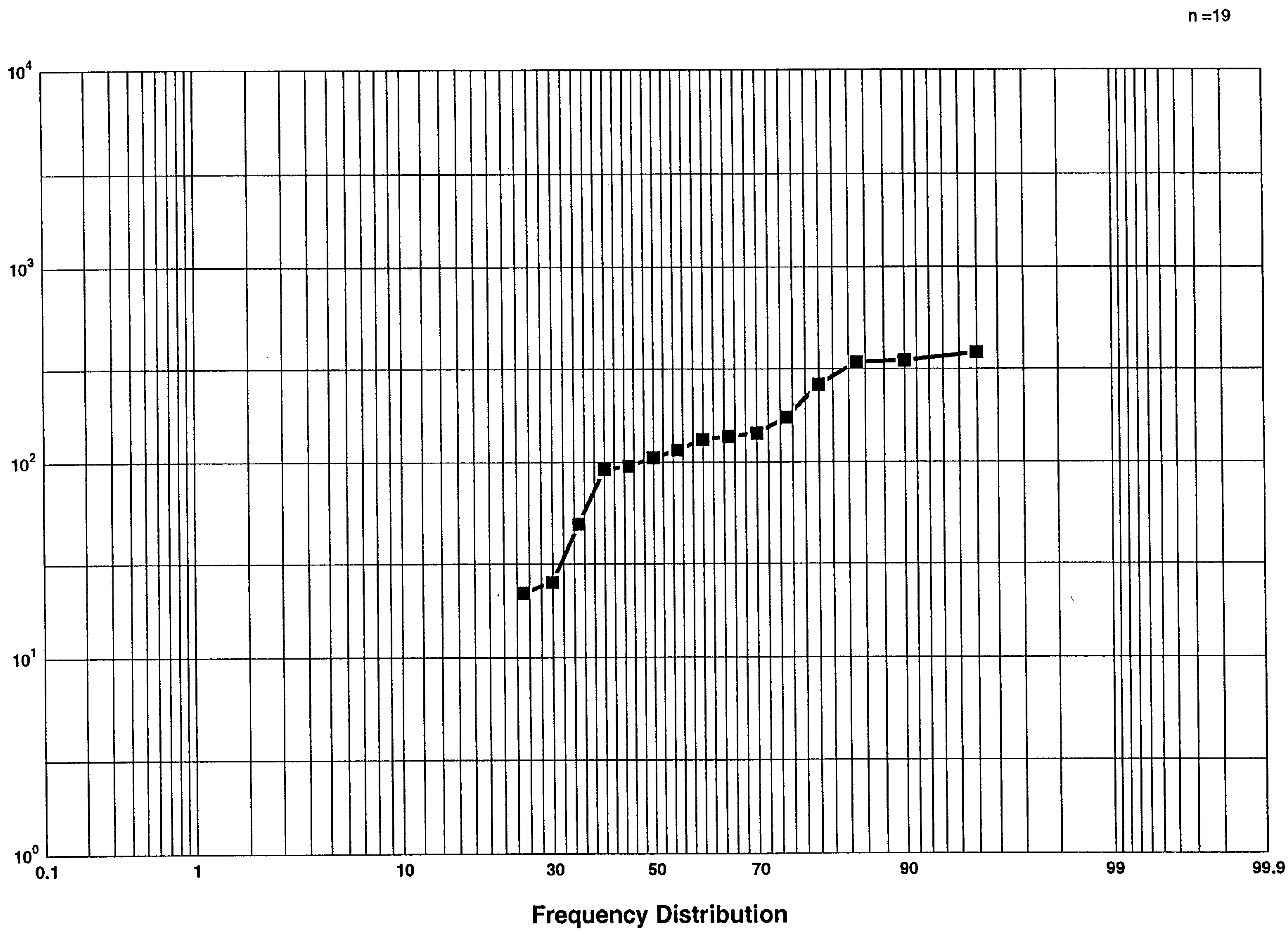


Figure 4-15a Zinc Concentrations in Sediment

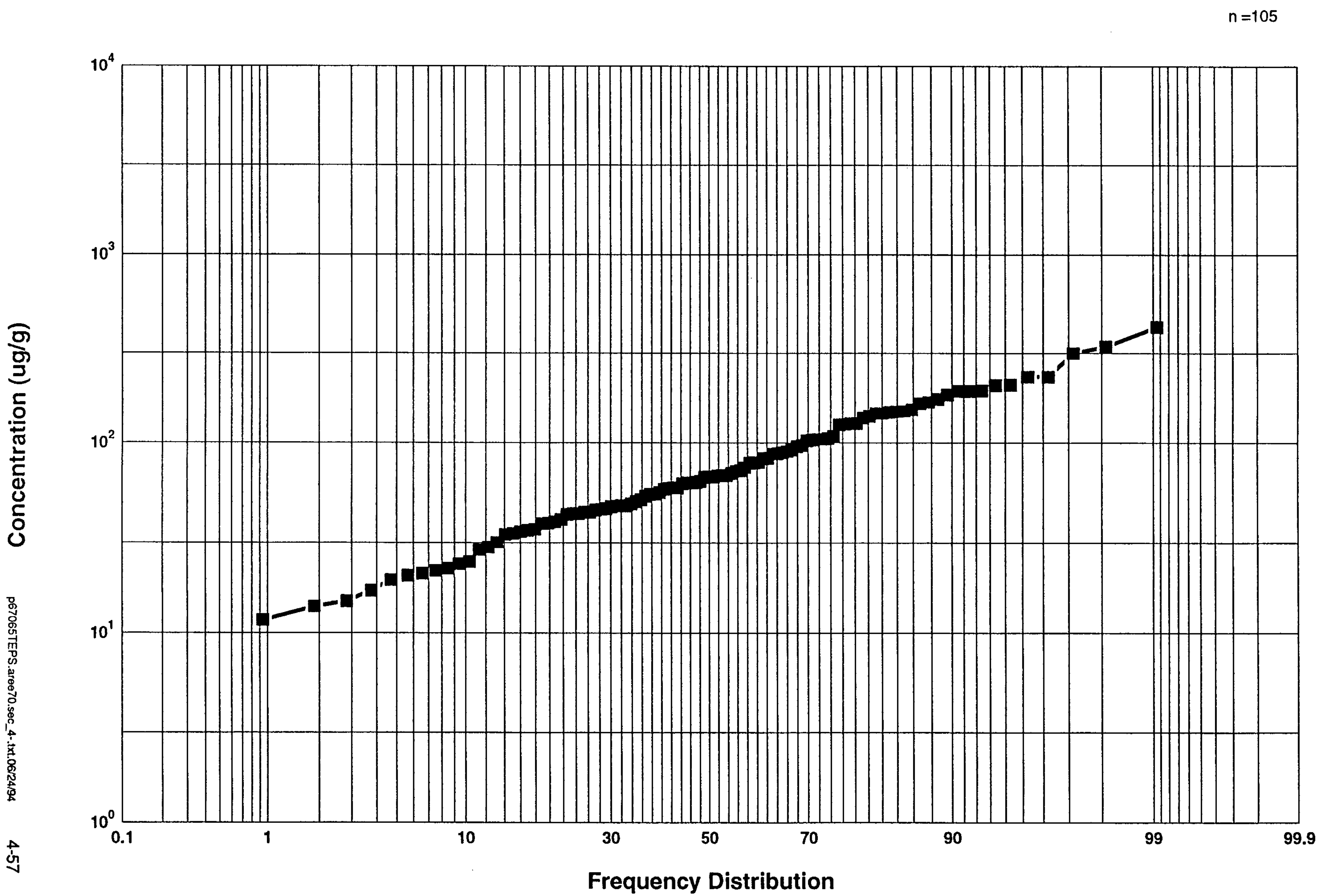
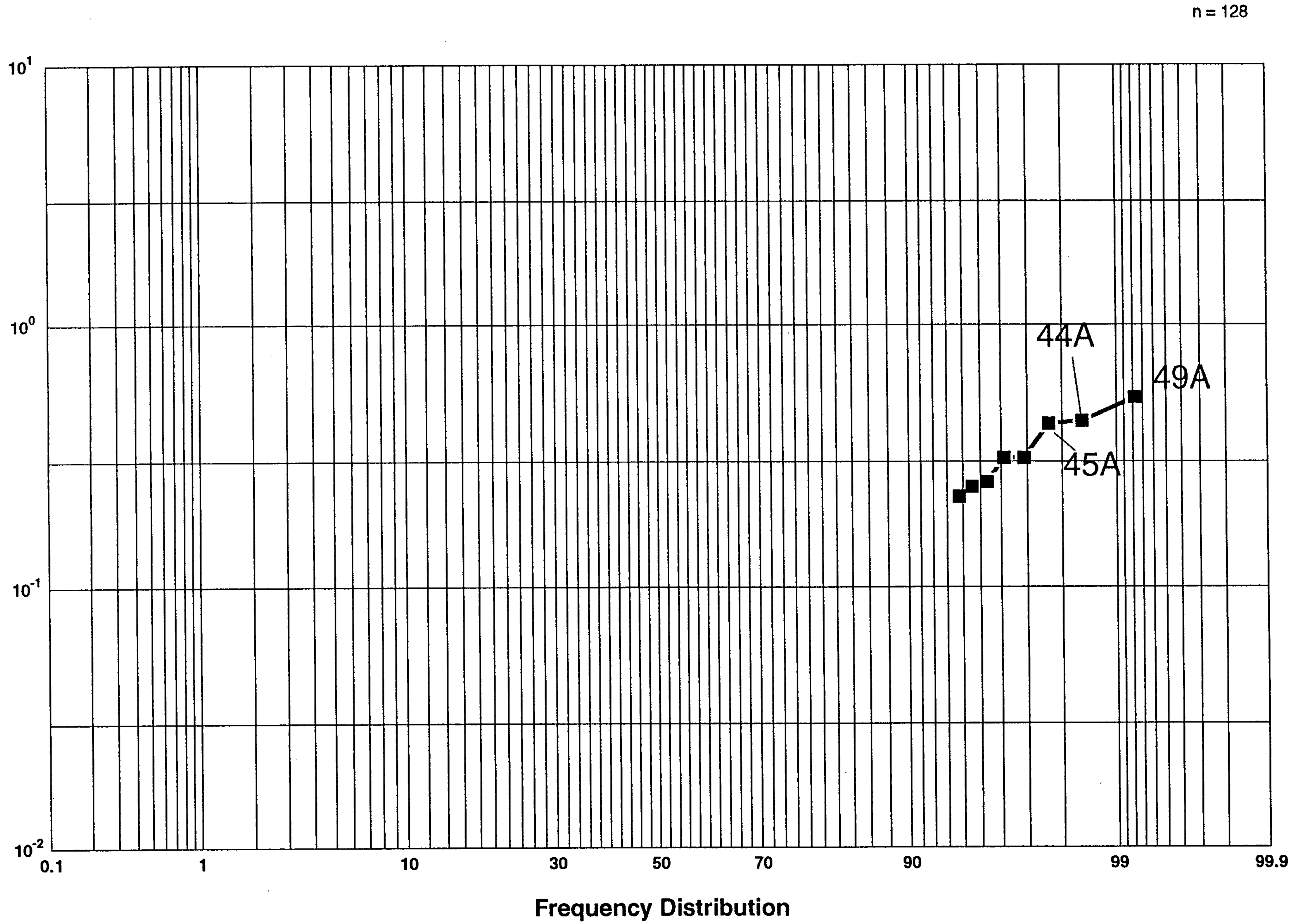
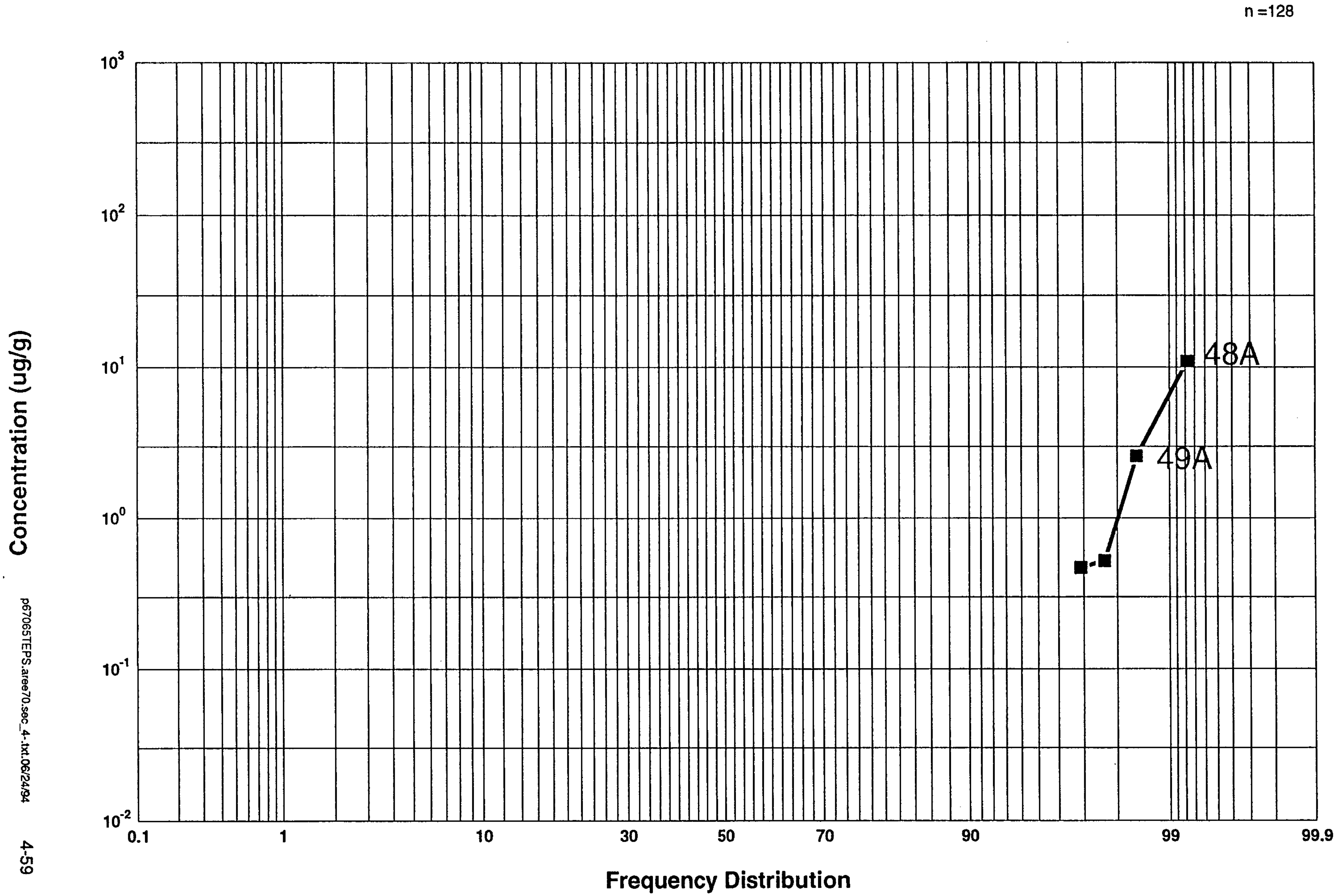


Figure 4-16 1,1,1-Trichloroethane Concentrations in Sediment



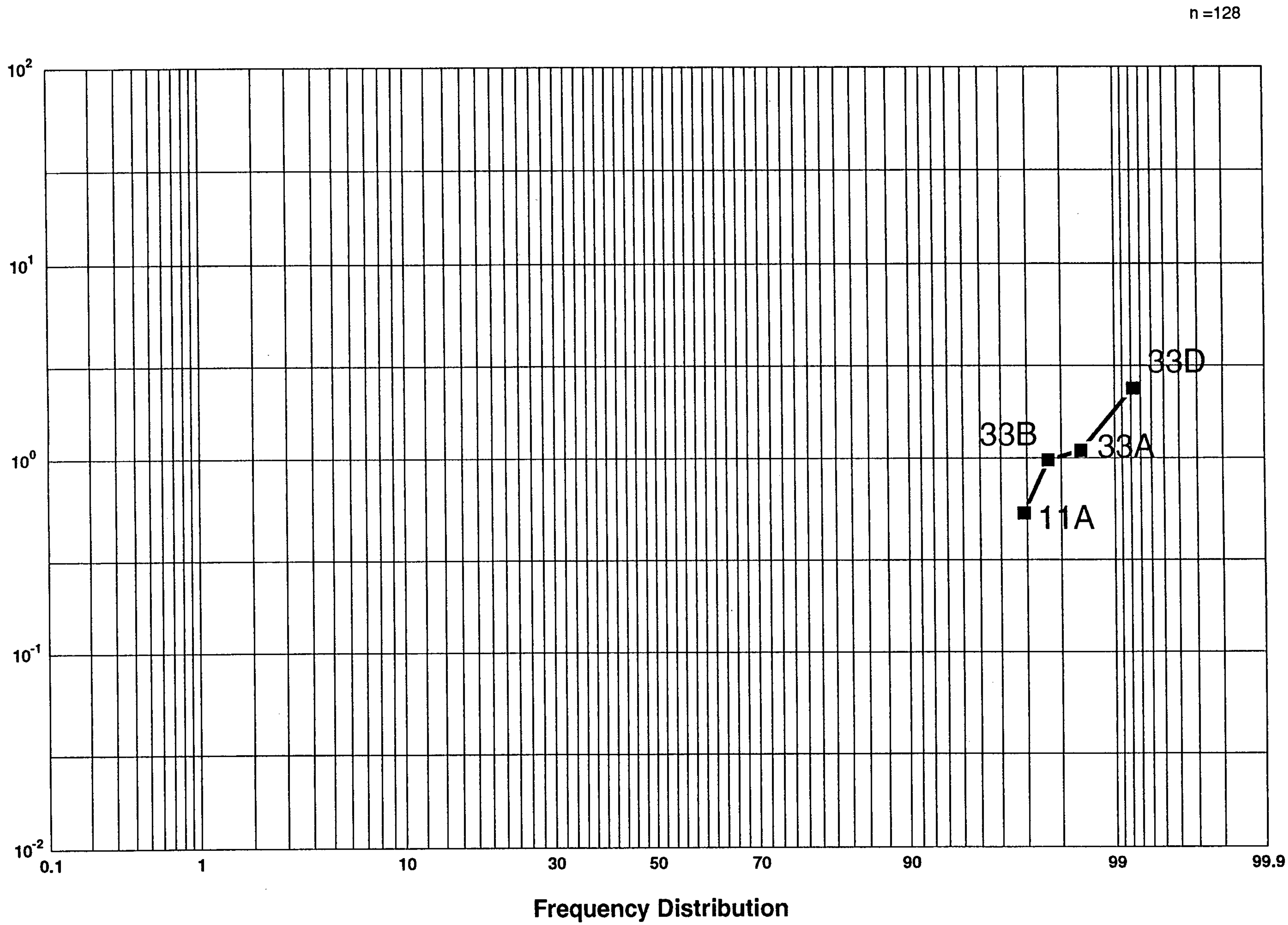
* Annotated points are outliers' system identification codes

Figure 4-17 1,1,2,2-Tetrachloroethene Concentrations in Sediment



* Annotated points are outliers' system identification codes

Figure 4-18   1,2-Dichloroethene Concentrations in Sediment



* Annotated points are outliers' system identification codes

Figure 4-19 Benzene Concentrations in Sediment

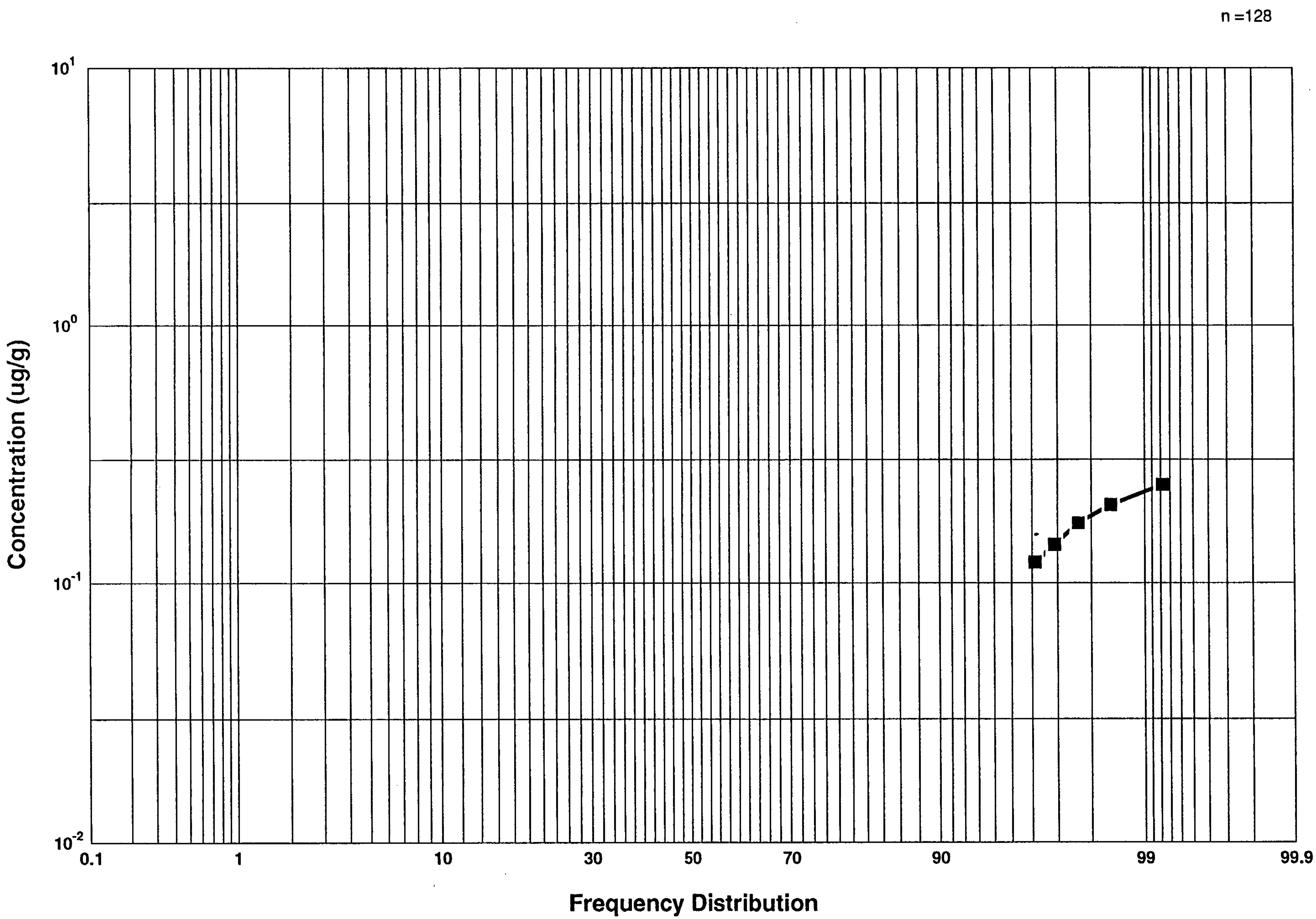
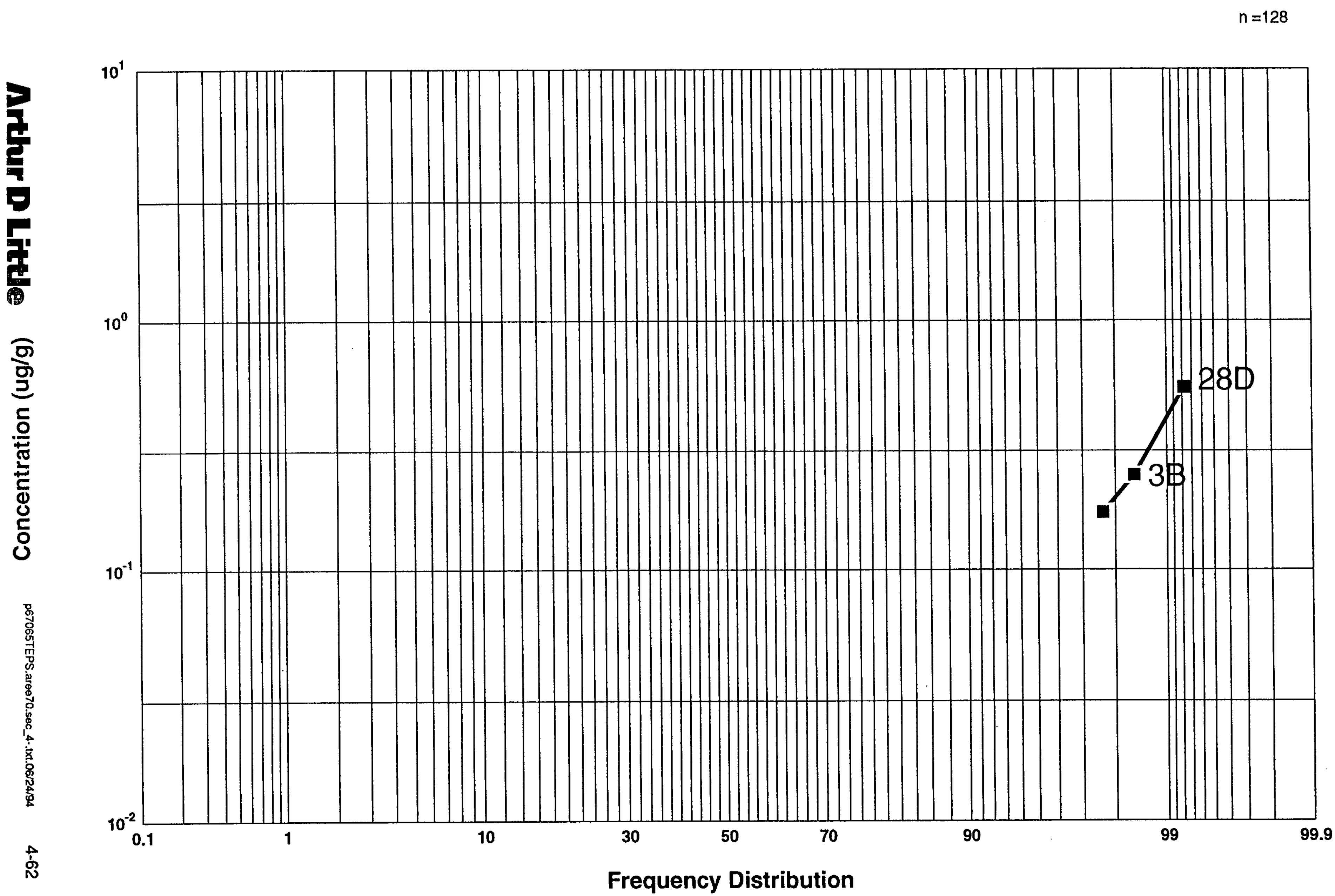
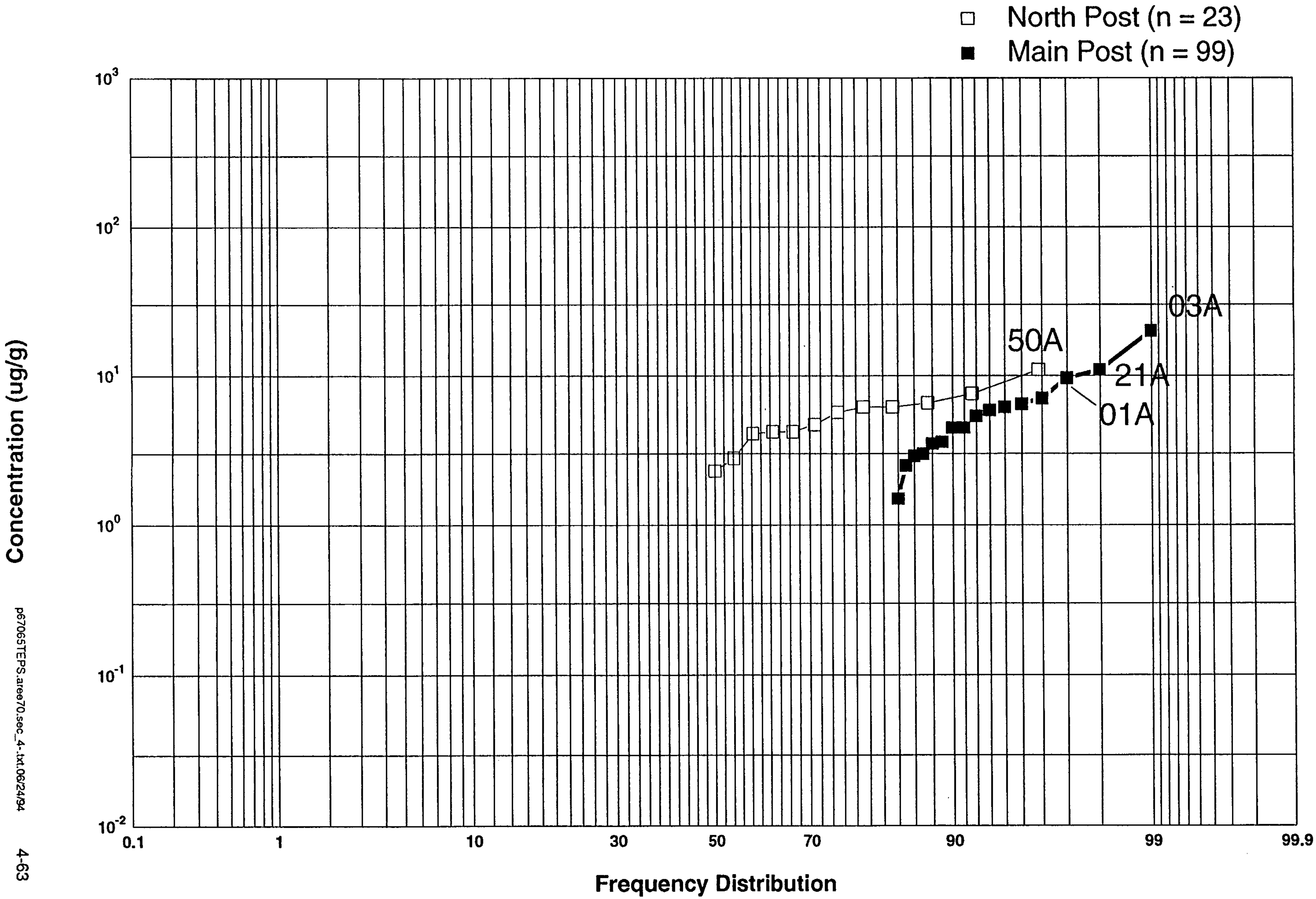


Figure 4-20 Perchloroethylene Concentrations in Sediment



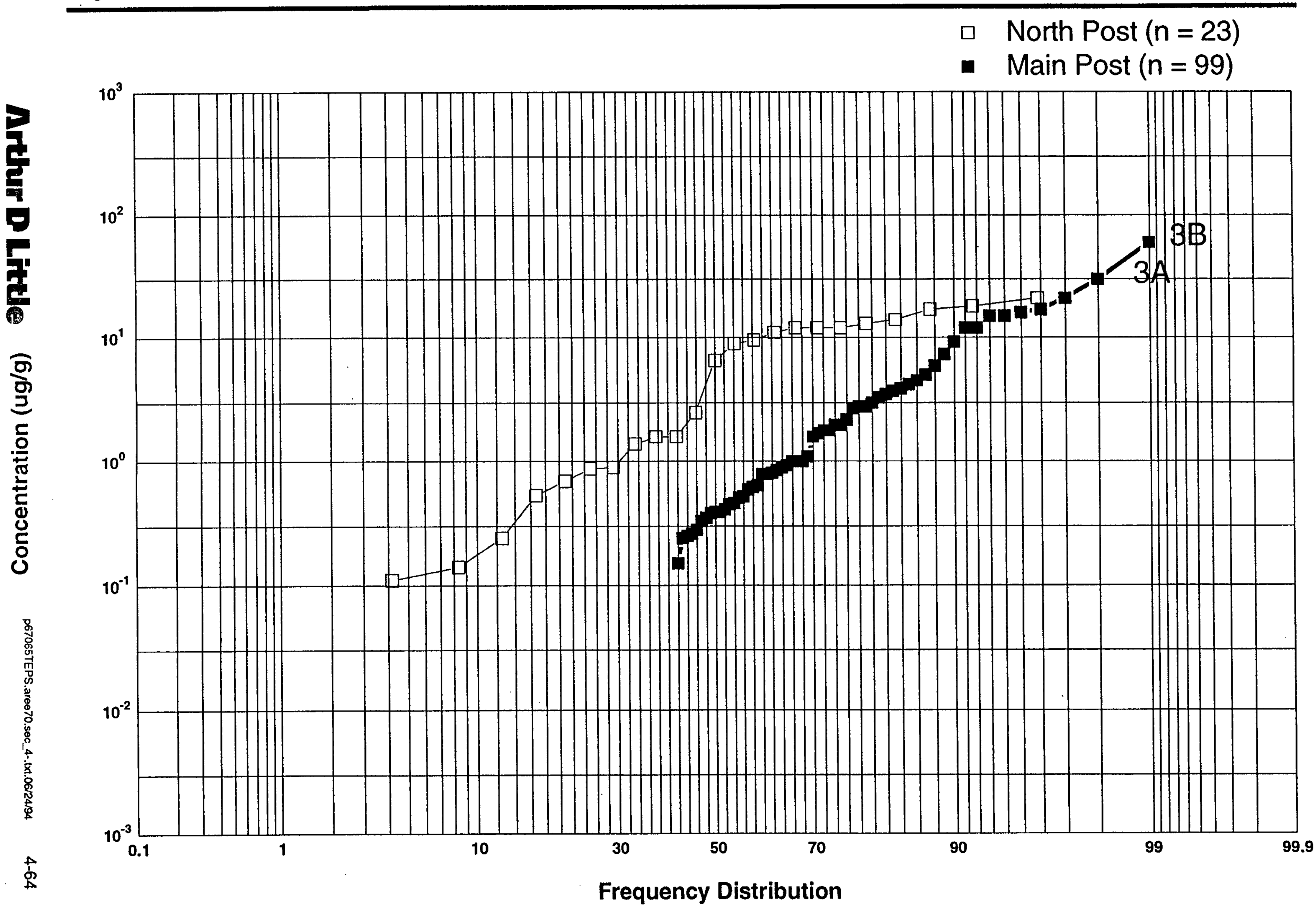
* Annotated points are outliers' system identification codes

Figure 4-21 Anthracene Concentrations in Sediment at the Main and North Posts



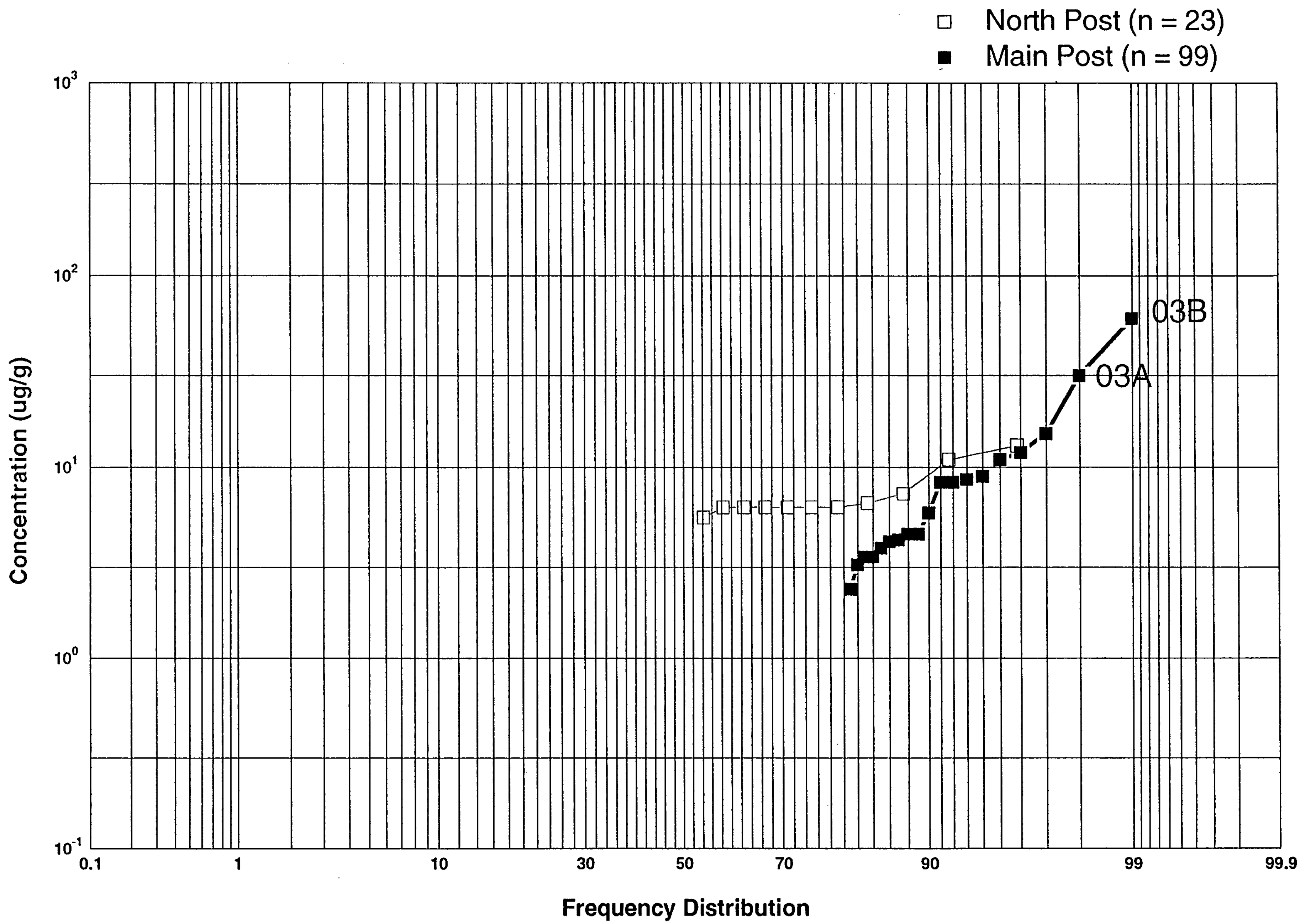
* Annotated points are outliers' system identification codes

Figure 4-22 Benzo(a)anthracene Concentrations in Sediment at the Main and North Posts



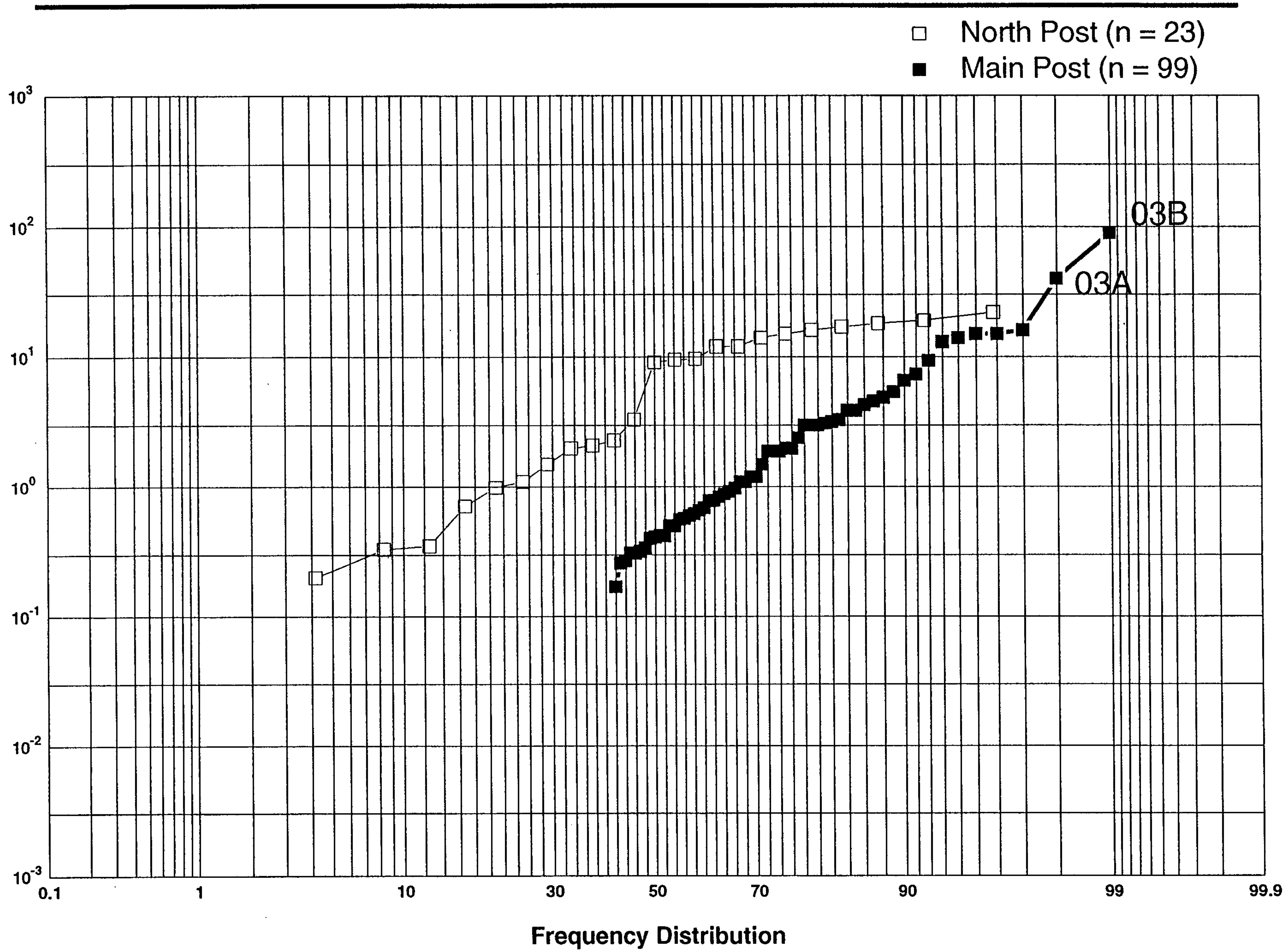
* Annotated points are outliers' system identification codes

Figure 4-23 Benzo(a)pyrene Concentrations in Sediment at the Main and North Posts



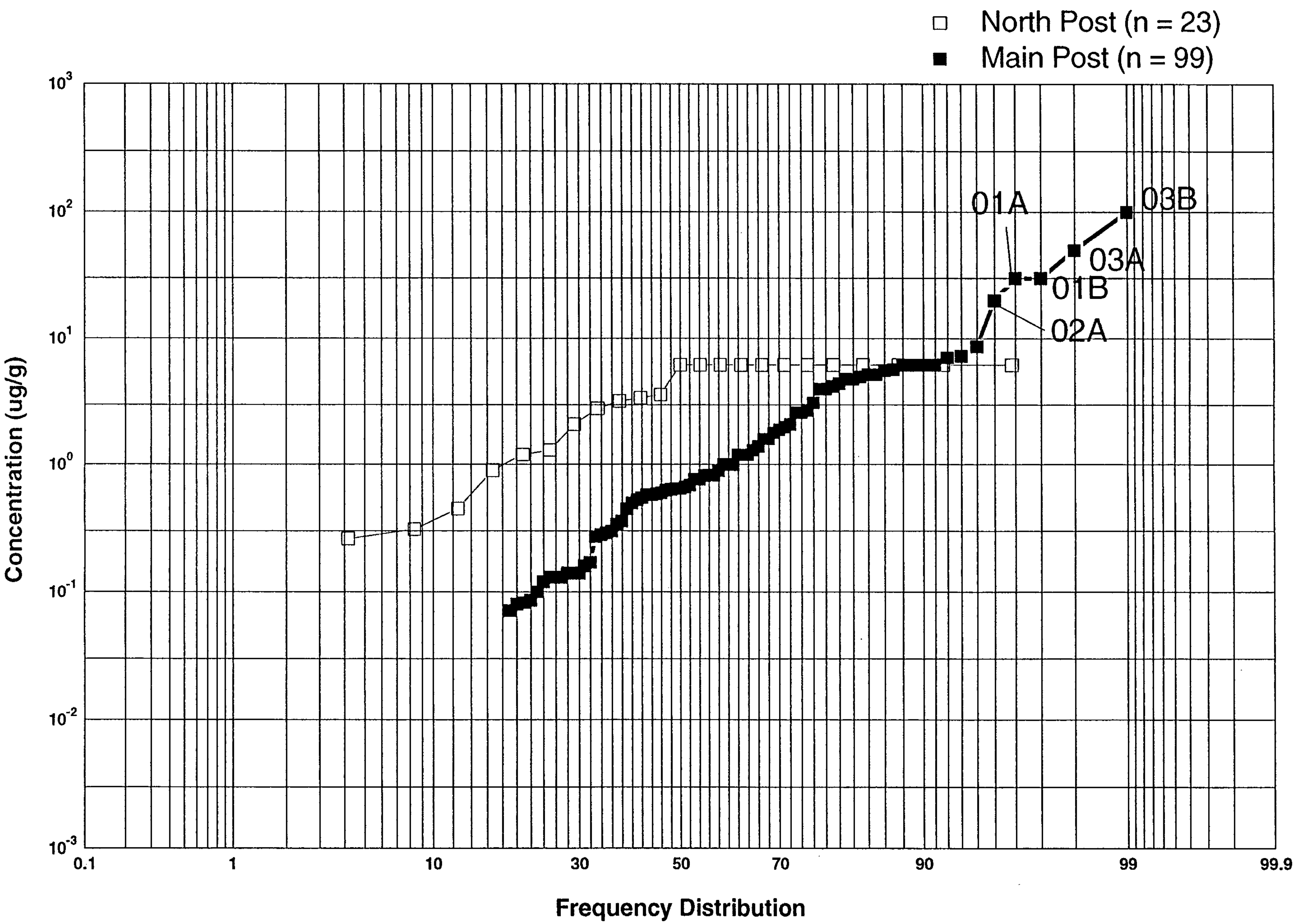
* Annotated points are outliers' system identification codes

Figure 4-24 Chrysene Concentrations in Sediment at the Main and North Posts



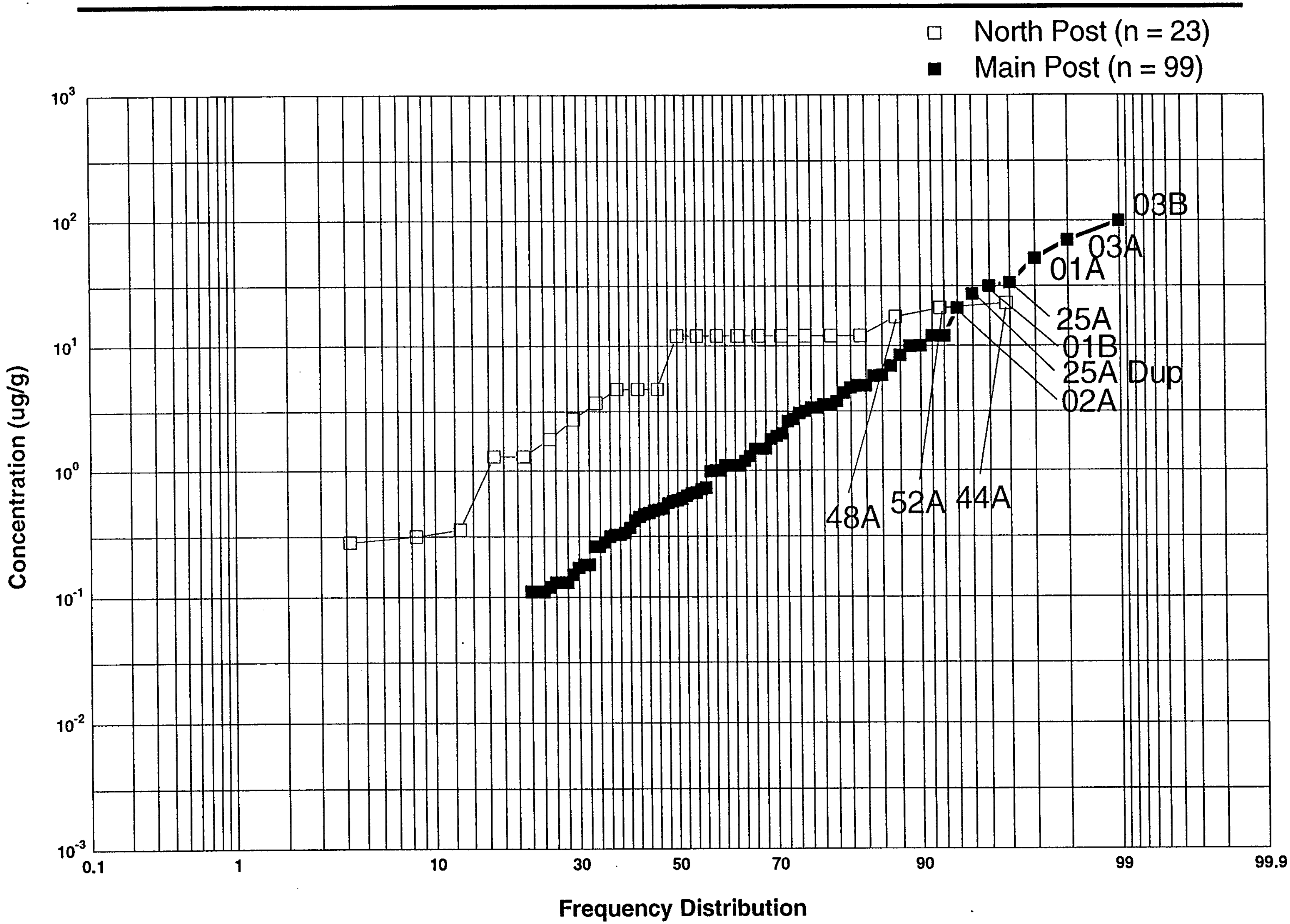
* Annotated points are outliers system identification codes

Figure 4-25 Fluoranthene Concentrations in Sediment at the Main and North Posts



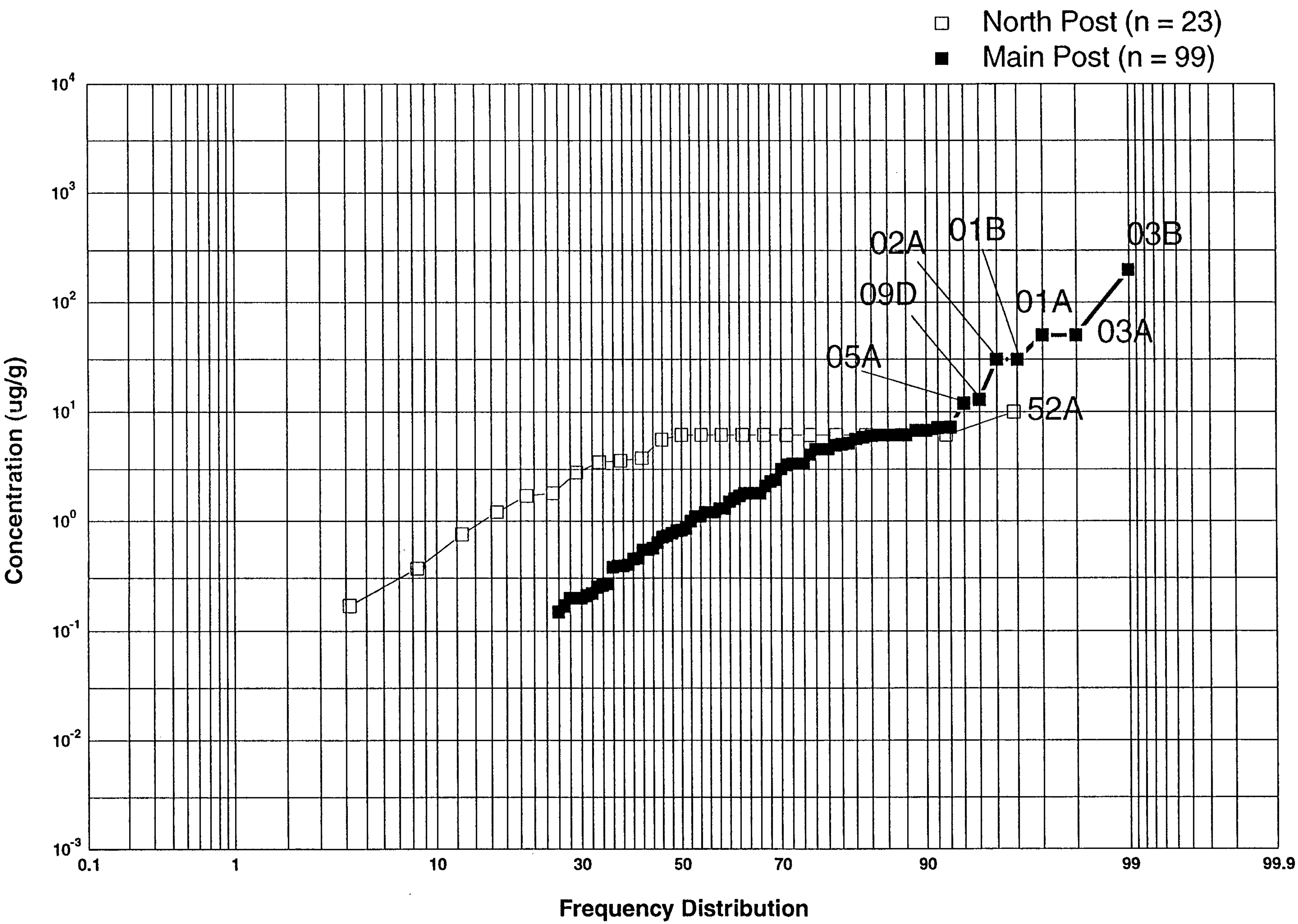
Annotated points are outliers system identification codes

Figure 4-26 Phenanthrene Concentrations in Sediment at the Main and North Posts



* Annotated points are outliers system identification codes

Figure 4-27 Pyrene Concentrations in Sediment at the Main and North Posts



* Annotated points are outliers system identification codes

Table 4-1: Summary of Systems of Concern

System #	Sediment Outlier	Water Outlier	Sediment "High"	Water "High"
1	Anthracene, fluoranthene, pyrene	Copper, lead	None	None
2	Fluoranthene, pyrene	Arsenic	None	None
3	Chromium, perchloroethylene, anthracene, benzo(a)anthrecene, benzo(a)pyrene, chrysene, fluoranthene, pyrene	Lead	2-methylphenol, 4-methylphenol, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, indeno(1,2,3-c,d)pyrene	None
5	Arsenic, beryllium, cobalt, chromium, nickel, pyrene	None	Aluminim, potassium, magnesium	None
6	Arsenic, chromium, lead	Arsenic, lead	Tin	None
7	Arsenic, barium, beryllium, cobalt, nickel	None	Manganese, sodium	None
11	DDD, DDT, 1,2-dichloroethene, total pesticides	None	Endosulfan II, heptachlor epoxide, 2-methyl napthalene	None
14	DDD, DDT, DDE	DDD, DDE, DDT, Total Pesticides, arsenic, barium, lead, vanadium	None	None
33	Arsenic, chromium, cobalt, nickel, 1,2-dichloroethene	None	Iron	None

6706568TEPS.aree70.tab_4-1.06/24/94

Table 4-2: Summary of Isolated Elevated Analytes

System #	Sediment Outlier	Water Outlier	Sediment "High"	Water "High"
9	Pyrene, DDT	Arsenic, total pesticides	Endrin Ketone	None
12	DDD, DDT	Not Collected	None	None
20	Selenium	Not Collected	None	None
21	Barium, anthracene	Not Collected	None	None
25	Selenium	Not Collected	Acenaphthyene	None
28	Perchloroethylene	Not Collected	Dieldrin	None
35	Chromium, lead	Not Collected	None	None
37	Chromium	Vanadium	None	None

Table 4-3: Summary of Airfield Outliers

System #	Sediment Outlier	Water Outlier	Sediment "High"	Water "High"
41	Vanadium, benzene	Not Collected	None	None
43	Barium, selenium	Not Collected	None	None
44	Barium, 1,1,1-trichloroethane, phenanthrene	Not Collected	None	None
45	Selenium, 1,1,1-trichloroethane	Not Collected	None	None
48	1,1,2,2-tetrachloroethene, phenanthrene	Not Collected	Bromoform	None
49	1,1,1-trichloroethane, 1,1,2,2-tetrachloroethene	Not Collected	Acenaphthylene	None
50	Anthracene	Not Collected	Fluorene, naphthalene, 2-mm,ethylnaphthalene	None
52	Phenanthrene, pyrene	Not Collected	None	None
54	Barium	Not Collected	Boron	None

5.0 Conclusions and Recommendations

5.1 Introduction

The following conclusions and recommendations are based on a comparison of the historical land use and sample location information presented in Section 3.0 with the results of the system-specific trends identified in Section 4.0. These conclusions and recommendations are based on internal, systemwide results for each of the 55 systems evaluated. This report and the recommendations in this section were limited to the contaminants found within the storm sewer systems. Receiving waters were not evaluated and conclusions and recommendations do not address receiving water quality. As a result, no comparisons have been made to published state or federal human health and ecological risk criteria or compliance standards.

The storm sewer system evaluation (AREE 70) was designed to support the objective of identifying potential sources of contamination that were not previously identified through other studies. As a result of this evaluation, no new confirmed sources of contamination were identified. Potential contamination was, however, identified in Systems #7, #14, #21 and #25, which is inconsistent with present and historical land use and AOCs, SAs, and AREEs associated with the systems. Additional sampling is recommended to confirm results of this evaluation. Systems #1, #2, #3, #4, #5, and #6 had potential contamination identified that was consistent with past and present land use and associated AOCs, SAs, and AREEs. Additional sampling has been recommended to further evaluate the nature and extent of possible contamination. The conclusions make reference to existing AOCs, SAs, and AREEs either associated with the storm sewer system or near the system. The conclusions and recommendations in this section address only those systems that appear to have statistical outliers for analytes of concern identified in Section 4.0.

Specific systems have been identified as systems of concern and the conclusions and recommendations are discussed in this section. These conclusions and recommendations are organized into three sections. The first section discusses the 10 systems considered to be systems of concern. These systems had three or more statistical outliers on the lognormal frequency graphs. The second section discusses recommendations for the eight systems that had isolated outliers, which are defined in this study as having less than three outliers on the lognormal frequency graphs. The third section discusses recommendations for the 15 systems located at the airfield, on the North Post. These systems were evaluated separately from the other systems.

5.2 Conclusions and Recommendations: Systems of Concern

Many analytes did not show outliers on the lognormal frequency graphs (e.g., TPH). For these analytes, it was determined that they are lognormally distributed within the storm sewer systems at Fort Devens. As a result, no systems of concern were identified as including those analytes determined to be lognormally distributed. Many of these analytes are typically found associated with motor repair facilities, vehicle storage areas, and maintenance shops. For systems determined to be systems of concern or having isolated elevated analytes, the surrounding land use and associated AOCs, SAs, and AREEs were examined.

5.2.1 System #1

The presence of semivolatile organic compounds in system #1 is consistent with the area's use for vehicle storage. Historical land use of this area was as a railyard from 1943 to 1952. The entire area drained by system #1 is currently occupied by the Massachusetts Army National Guard. The National Guard operations include vehicle maintenance, storage, and transportation. There are no AOCs, SAs, or AREEs associated with system #1 that could be contributing contaminants to the storm sewerage system. The ultimate discharge point of system #1 is Cold Spring Brook.

Further sampling is recommended for system #1 because of the nature of contaminants detected as outliers in the system and because there are no AOCs, SAs, or AREEs associated with the system that could be contributing contamination. It is recommended that sampling begin at the outfall and continue downstream in the drainage swale towards Cold Spring Brook. The purpose of this sampling would be to identify the nature and extent of contamination and the potential impacts on Cold Spring Brook. Contaminant source control such as oil/water separators should be installed at the National Guard compound to prevent potential releases from these operations reaching receiving waters.

5.2.2 Systems #2, #3, and #4

As noted in Section 3.0, system #2 drains into the same outfall drainage swale as system #1, and the western portion of system #2 flows into system #3. In addition, systems #3 and #4 are connected. As a result, these three systems are combined and will be treated as a group. System #2 had outliers for semivolatile organic compounds and one outlier for arsenic in the water sample. System #3 and #4 had outliers for metals, volatile organic compounds, and semivolatile organic compounds in sediment and one outlier for lead in water.

These outliers in systems #2 and #3 are consistent with current and historical land use in the area. The sample point for system #2 was located adjacent to the Massachusetts Army National Guard. The current and historical operations in this area include vehicle repair shops and vehicle storage yards since 1943. System #3 also drains an area adjacent to the National Guard. There are a number of AOCs and

AREEs associated with systems #3 and #4, including AOCs 44 and 52, and AREEs 61AU and 61B. However, there was no clear contaminant trend identified that could be attributed to a specific AOC or AREE. Sample 3B, which was collected at the system's outfall, had the highest concentration of several polynuclear aromatic compounds, which could be attributed to the motor pools and vehicle storage operations in this area. The ultimate discharge point of the three systems is Cold Spring Brook.

Further sampling is recommended starting at the outfall at system #3 and continuing downstream, in the drainage swale toward Cold Spring Brook. The purpose of this sampling would be to identify the nature and extent of contamination and the potential impacts on Cold Spring Brook. Contaminant source control such as oil/water separators should be installed in areas where vehicles are maintained and/or stored if these areas will continue to be used as vehicle maintenance and storage areas after Fort Devens closes. These areas could include: the National Guard compound, AREE 61B (3773) and the vehicle storage area at AREE 61AU (3757, 3758) to prevent potential releases from these operations impacting receiving waters.

5.2.3 System #5

System #5 had outliers for metals and one semivolatile organic compound in sediment. Samples were only collected at the outfall of this system because it is a small system draining to a drainage swale and ultimately to Grove Pond. The presence of metals and semivolatile organic compounds in system #5 is consistent with historical land use as motor pools, vehicle repair shops, and vehicle storage yards. The land use in this area has been consistent since 1943, and AOC 44 and 52 are the only AOC, SA, or AREE associated with system #5. In addition, system #5 drains an area occupied by the Massachusetts Army National Guard.

Further sampling is recommended starting at the outfall and continuing downstream, in the drainage swale toward Grove Pond. The purpose of this sampling would be to identify the nature and extent of contamination and the potential impacts on Grove Pond. AOCs 44 and 52 may be contributing contamination to system #5 given the nature of the contamination that was found in the system. However, these AOCs are recommended for remediation; therefore, source control of contaminants will be achieved through the soil removal action. In addition, contaminant source control such as oil/water separators should be installed at the National Guard compound to prevent potential releases from these operations impacting receiving waters.

5.2.4 System #6

System #6 had outliers for metals in sediment and water. This system drains a number of current motor pools, SAs, and AREEs. The outfall for system #6 exhibited elevated concentrations of metals compared to other sample points within the system. In addition, the outfall for system #6 had the highest TPH concentration within the

system. SA 38, which was affiliated to battery disposal operations, and SA 57, which investigated a fuel oil spill at Building 3713, are both associated with system #6 and may have contributed contaminants to the system. Other historical land use in the area includes vehicle storage and maintenance facilities. The ultimate discharge point of system #6 is Cold Spring Brook.

Because system #6 had outliers for metals and received the fuel spill investigated as SA 57, further sampling is recommended. Sampling downstream of the outfall, in the drainage swale, toward Cold Spring Brook, is recommended to determine the extent of contamination. If the area outside of Building 3712 (AREE 61AU) is to be used for vehicle and storage trailer parking after Fort Devens closes, oil/water separators should be installed in the parking lot to reduce the potential of any runoff impacting the receiving waters.

5.2.5 System #7

System #7 had outliers in sediment for several metals. The sample from the outfall of system #7 had higher concentrations of metals than the sample collected within the system. There are no AOCs, SAs, or AREEs associated with system #7. Upgradient of this system is a driver training area and railroad tracks. As a result, the metals observed in system #7 are not consistent with known present or historical land use in the area. The ultimate discharge of system #7 is Cold Spring Brook.

Because the source of the metals in this system is unknown, additional sampling for metals is recommended for system #7. Sampling should be conducted downstream of the outfall, in the drainage swale, toward Cold Spring Brook, to determine the nature and extent of contamination.

5.2.6 System #11

System #11 had outliers in sediment for pesticides and one volatile organic compound, 1,2-dichloroethane. AREE 61BD, the DRMO contractor's yard, is the only AREE associated with the system. It appears that, in general, the upstream sample 11B had a higher concentration of contaminants than the outfall sample 11A. However, 1,2-dichloroethane was detected at the outfall. The concentration of this volatile organic compound was 0.52 mg/kg in sediment, which is a low concentration and was the only volatile organic compound detected at the outfall. As a result, any contaminants reaching the storm sewer system from the DRMO contractor's yard are most likely not being transported downstream. AREE 61BD is being investigated further under the BRAC EE supplemental investigations. Therefore, because there are no other likely sources of contaminants associated with system #11, the potential contaminant source is being investigated. Additionally, the concentrations of pesticides observed in system #11 are very low and may be associated with surface runoff from grassed areas and roadways. If the DRMO contractor's yard is to be used for vehicle and equipment storage in the future, a system that will intercept any

potential contaminants from surface runoff, such as an oil/water separator, should be installed at this site.

Because the concentrations of contaminants is relatively low and the most likely source of contamination is being investigated, no further action is recommended for system #11.

5.2.7 System #14

System #14 had outliers for pesticides and metals. In general, the highest concentrations of contaminants identified within system #14 were found in the outfall samples. Sample location 14B had the highest concentrations of volatile organic compounds, however, the concentrations of these compounds were very low. As a result, it is difficult to determine the potential source of these compounds. The only AOC, SA, or AREE that could affect system #14 is AREE 61Z, which is an historical motor pool. The metals observed in system #14 may be attributable to operations at this motor pool, but the pesticides and volatile organic compounds are not consistent with known land use. The concentrations of pesticides and metals are low enough, however, that they may be attributed to pesticide application. Furthermore, AREE 61Z is being investigated under supplemental BRAC EE investigations.

Additional water and sediment sampling is recommended at the two outfalls (sample locations 14A and 14C) for purposes of data verification. Sample analyses should include metals and pesticides.

5.2.8 System #33

System #33 had outliers for metals and one volatile organic carbon compound, 1,2-dichloroethane. The highest concentrations of metals and volatile organic compounds observed in system #33 were all found at sample point 33D, which is the most upstream sample location. This sample location is immediately downgradient of the large motor pool designated as AREE 61O. As a result, these results are consistent with known present and historical land use in the area of sample 33D. The concentration of contaminants detected in system #33 trends towards lower concentrations nearing the outfall. As a result, it does not appear that contaminants are being transported downstream in the storm sewer system.

Because it appears that contaminants from the motor repair operations at AREE 61O may be reaching the storm drain system, runoff control is recommended for this site. If Building 2517 continues to be used as a motor repair facility after Fort Devens closes, the site should be reevaluated to ensure that runoff from the site will not impact the storm sewers. Improvements could include upgrading existing oil/water separators or installing new units. No further action is recommended for system #33 because the most likely source of contamination has been identified.

5.3 Conclusions and Recommendations: Isolated Elevated Analytes

5.3.1 System #9

System #9 is a large system draining a number of different land use areas including industrial, residential, and commercial properties. Only two outliers were identified within system #9, pyrene and DDT. Both of these outliers were detected at sample location 9D, which is located adjacent to the Buena Vista Housing area. There is one SA and a number of AREEs associated with system #9. Based upon the contaminants detected in system #9, however, and the lack of a contaminant trend within the system, there does not appear to be a correlation between this system and associated SAs and AREEs.

The pesticide and semivolatile organic compounds observed in system #9 may result from routine surface runoff from grassed areas and roadways. However, given the location of the contaminant outliers (adjacent to a housing area) additional sampling of sediment and surface water for semivolatile organic compounds and pesticides is recommended at location 9D. This sampling is suggested to confirm the current sample results.

5.3.2 System #12

System #12 had outliers in sediment for DDD and DDT. Each sample location in system #12 had some concentrations of pesticides. However, sample location 12C had an outlier for DDD and the most elevated concentration of TPH within the system. This sample location is adjacent to pesticide and maintenance shops designated as SAs 33, 34, and 35 and AREEs 61AB and 61A. Each of these SAs and AREEs have been identified and have either been studied, or are undergoing supplemental investigations or removal actions. The concentration of DDT at the systems outfall is low and is most likely the result of normal residuals in runoff from grassy areas.

No further action is recommended for system #12 since potential contamination sources (AREEs and SAs) associated with the system are being investigated in other studies.

5.3.3 System #20

System #20 had one isolated outlier in sediment for selenium. This system is a large system draining a number of land use areas, including residential, commercial, and industrial areas. In addition, there are a number of SAs and AREEs associated with system #20. There are no clear contaminant trends identified within system #20 and only one outlier for selenium. The concentration of selenium was low and there are no clear sources for this contaminant within this system. Furthermore, there is no evidence of a trend of other contaminants that suggests a concern at system #20. No further action is recommended.

5.3.4 System #21

System #21 had two isolated elevated analytes for barium and anthracene in sediment. The outfall sample location 21A had the highest concentrations of polynuclear aromatic hydrocarbons within this system. There are two AREEs associated with system #21, the Fort Devens fire station AREE 61AW and AREE 69R. It is unlikely that the fire station is contributing semivolatile organic compounds to the storm sewer system and AREE 61AW was determined to be NFA in the Draft AREE 61 report. In addition, AREE 69R investigated a PCB spill and no PCBs were detected in any samples in this system. There is no evidence of a trend of other analytes within system #21.

Because of the isolated concentrations of semivolatile organic compounds detected at the outfall of system #21, additional sampling at the outfall is recommended. Both surface water and sediment samples should be collected and analyzed for semivolatile organic compounds.

5.3.5 System #25

System #25 had one metal outlier in sediment for selenium. This system drains an area that was occupied by a hospital from 1943 to 1972. The only SA associated with this system is SA 55, which investigated an underground storage tank removal operation. It is unlikely that contaminants from the tank removal impacted the storm sewer system. This system had a number of semivolatile organic compounds detected at the outfall. These semivolatile organic compounds and select metals are not consistent with known historical land use in the area. This area is currently used as a trailer park.

Additional water and sediment sampling is recommended for purposes of data verification. Analyses should include metals and semivolatile organic compounds. It is recommended that samples be collected from both the outfall and an internal manhole.

5.3.6 System #28

System #28 had one isolated outlier in sediment for perchloroethylene. System #28 also had the "highest concentration" of the pesticide, dieldrin, found in the data sorted by analyte parameter and concentration (at sample point 28C). Sample location 28C is downgradient of SA 36, a pesticide shop undergoing a removal action. There were no other contaminant trends identified within system #28. No further action is recommended for system #28 because the most likely source of contamination, SA 36, has been identified and is undergoing a removal action of contaminated soils.

5.3.7 System #35

System #35 had two isolated outliers in sediment for chromium and lead. These contaminants were detected in sample locations 35C and 35B. In addition, sample location 35A had the highest concentrations of semivolatile organic compounds

compared to the other sample points within the system. AREE 61J, an active motor repair facility is the only AOC, SA, or AREE associated with this system. All sample points are downgradient of this AREE. This AREE is undergoing supplemental investigations as part of the BRAC EE. The metals and semivolatile organic compounds detected within this system are most likely surface water runoff from motor repair operations. As a result, no further sampling is recommended. If Buildings 612 and 613 and the surrounding area will continue to be used as a motor repair facility after Fort Devens closes, then runoff controls are recommended to prevent contaminants from impacting the storm sewer system. The existing oil/water separators in this motor pool should be upgraded or new units installed.

5.3.8 System #37

System #37 had one outlier for chromium in sediment. This outlier was located at sample point 37D. This sample point also had the highest concentrations of semivolatile organic compounds as compared to other sample locations within the system. This sample point is upstream of active motor repair operations and any SAs and AREEs associated with system #37. However, the semivolatile organic compound and chromium concentrations are near the detection limit for these compounds and determined not be of concern. One water sample was collected at the outfall for this system. Trichloroethane was detected in the sample but below concentration levels of concern. Furthermore, the outfall for this system is downstream of SAs 43H and 43I, which are being investigated under supplemental investigations. No further action is recommended for system #37 because the concentrations of contaminants detected are very low and associated AOCs, SAs, and AREEs that may be potentially contributing contaminants to the system are being investigated.

5.4 Conclusions and Recommendations: The Airfield Systems #41 through #54, North Post

Nine of the thirteen systems at the airfield exhibited outliers for one or more contaminants. The contaminants identified as outliers include metals, semivolatile organic compounds, and volatile organic compounds. Semivolatile organic compounds were detected in each system at the airfield. These compounds are common degradation products of the combustion of petroleum products including jet fuel. Furthermore, naphthalene and 2-methylnaphthalene were detected as the highest concentrations in sediment. The presence of these compounds further supports the conclusion that the semivolatile organic compounds are most likely residuals from the combustion of jet fuel. The concentrations of metals detected at the airfield were low and cannot be attributed to a specific source. The volatile organic compounds detected in four of the outfalls at the airfield cannot be attributed to a specific source. These compounds may be attributed to runoff from airfield operations.

None of the AOCs, SAs, or AREEs associated with the airfield are identified as potentially continuing to contribute contaminants to the storm sewer systems. In addition, no new AREEs are identified at the airfield. The presence of the compounds detected in the airfield systems is consistent with the land use as an airfield since 1943. If the airfield continues to be used for airfield operations after Fort Devens closes, runoff source controls are recommended. These controls could include upgrading or installing new oil water separators and evaluating airfield operations to ensure that potential contaminants will not impact the storm sewer systems. No further actions are proposed for the systems at the airfield given these results.

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Final

Addendum 1 - AREE 70 River Evaluation

Base Realignment and Closure Environmental Evaluation (BRAC EE) Fort Devens, Massachusetts

Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND 21010

Prepared by:

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Aberdeen Proving Ground, Maryland 21010

JUNE 1994

Final

Addendum 1 - AREE 70 River Evaluation

Arthur D Little

Base Realignment and Closure Environmental Evaluation (BRAC EE) Fort Devens, Massachusetts

R N Lambe 6-28-94
Program Manager, Robert Lambe — Date

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Project Manager, Richard Waterman — Date

Submitted to

U.S. Army Environmental Center (USAEC)
Aberdeen Proving Ground, MD

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List of Acronyms and Abbreviations

ABB	ABB Environmental Services
ADL	Arthur D. Little, Inc.
AOC	Area of Concern
AREE	Area Requiring Environmental Evaluation
EPA	United States Environmental Protection Agency
PAH	Polycyclic Aromatic Hydrocarbons
PCB/PEST	Polychlorinated Biphenyl/Pesticide
QA/QC	Quality Assurance/Quality Control
SA	Study Area
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TCL/BNA	Target Compound List/Base Neutral Acid
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
USAEC	U.S. Army Environmental Center
VOC	Volatile Organic Compound

1.0 Introduction

As part of Task Order No. 0005 (Fort Devens Base Realignment and Closure Environmental Evaluation) awarded to Arthur D. Little, Inc., by the U.S. Army Environmental Center (USAEC), a study was conducted of the 55 storm sewer systems and four of the surface water bodies at Fort Devens. Each of the storm sewer systems was assigned a discrete system number (#1 to #55), and each of the water bodies was assigned a discrete system number (#90 to #93). The storm sewer study (AREE 70) was conducted as part of a larger study that included the following Areas Requiring Environmental Evaluation (AREEs):

- Maintenance and Waste Accumulation Areas - AREE 61
- Previously Removed Underground Storage Tanks - AREE 63
- Transformers - AREE 66
- Past Spill Sites - AREE 69

This report addresses the section of the AREE 70 study in which sediment and water samples were collected from four water bodies at Fort Devens. The four water bodies are the section of the Nashua River that flows along the western side of the Moore Army Airfield (system #90); the portion of the Nashua River that flows along the western boundary of the Main Post (system #91); Cold Spring Brook, which drains the northeastern corner of the Main Post (system #92); and Willow Brook, which drains the central portion of the Main Post (system #93). Figures 1-1 through 1-4 show sediment and surface water sample locations at these rivers and brooks.

1.1 Previous Studies

Other studies of the Nashua River and Cold Spring Brook have been conducted as part of separate site investigations performed by Arthur D. Little and ABB Environmental Services (ABB) in 1992 and 1993. As part of the Group 2 and 7 Site Investigations and Historical Gas Stations Investigation conducted by ABB, 12 sediment and water samples were collected from the portion of the Nashua River that flows along the western side of the North Post (North Nashua River). These sample locations were selected because the area collects treated effluent from the sewage treatment plant and storm water runoff from the airport. Figure 1-1 shows the location of these sample points. As part of the Main Post Site Investigation conducted by Arthur D. Little in 1993, a series of samples were collected from the portion of the Nashua River that flows along the western side of the Main Post of Fort Devens. Sediment and water samples were collected from eight locations along the Nashua River as part of the site investigation for Area of Concern (AOC) 11. Figure 1-2 shows the locations of these samples.

As part of two other studies, one involving the Site Investigation of Group 3 sites and the investigation of Study Area (SA 57), eleven sediment and five water samples were collected from Cold Spring Brook by ABB.

1.0 Introduction

Figure 1-3 shows the location of ABB's sample points at Cold Spring Brook. All sample data analysis results from these previous studies have been combined with the results from the AREE 70 study to: (1) help evaluate the potential sources of contamination within the sediment and water of the Nashua River and Cold Spring Brook, and (2) determine potential contaminant trends. No known previous studies have been conducted at Willow Brook that would contribute historical data to this study. The AREE 70 sampling locations for Willow Brook are provided in Figure 1-4.

1.2 Project Objectives

The objective of the AREE 70 River Evaluation is to evaluate whether the storm sewer systems on Fort Devens act as potential pathways for introducing contamination to the river and brooks.

1.3 Project Approach

Sample locations were selected along the northern and central Nashua River, Willow Brook, and Cold Spring Brook. Sample points were located downstream of storm sewer system outfalls and any AOCs, SAs, or AREEs associated with that river/brook system. Both sediment and surface water samples were collected. Samples were sent to a USAEC-performance demonstrated laboratory and analyzed for TCL VOC, TCL BNA, TPH, TCL PCB/PEST, and TAL metals. In addition, sediment samples were analyzed for TOC and grain size, and water samples were analyzed for total suspended solids. A series of water quality parameters were recorded at the time each water sample was collected. The sampling methods used are discussed in Section 2.1 of the Storm Sewer System Evaluation (AREE 70) Report and in the Final Quality Assurance Project Plan. Data quality objectives are also included in Section 2.1 of the Storm Sewer System Evaluation (AREE 70) Report.

The results from the chemical analyses were reviewed to determine the extent of any potential contamination and identify the potential sources of contamination. Rather than evaluate each analyte separately, the entire analyte data set was evaluated to determine analytes that best represent potential sources of contamination. Target analytes were identified from the data set as typical contaminants commonly associated with industrial activities. The same analytes selected to evaluate the storm sewer data were used in this evaluation. Profiles of these analyte concentrations in sediments have been plotted for each of the systems to identify potential contaminant trends and possible sources of contamination. The target compounds analyzed are:

- Metals: Lead, nickel, zinc, arsenic, and chromium
- Total Petroleum Hydrocarbons (TPH)

- Semivolatile Organic Compounds (SVOCs): Benzo(A)pyrene, anthracene, and phenanthrene
- Volatile Organic Compounds (VOCs): Trichloroethylene and dichloroethylene
- Pesticides: Endosulphan
- Total Organic Carbon (TOC)

Target analytes were selected and plotted only if they were detected in the river/brook samples. If none of these analytes were detected, no graphs were produced. Therefore, not all surface water bodies systems have plots for each analyte. These typical industrial compounds were plotted to produce an analyte profile for each river/brook system.

1.4 River and Brook Descriptions

1.4.1 Northern Section of the Nashua River

The northern section of the Nashua River flows from the bridge where West Main Street crosses the river, to the point where the river exits the northwestern corner of the North Post. The drainage basin for this part of the river includes an area around the sewage treatment plant and the western side of the Moore Army Airfield. Storm sewer systems #48 through #54 drain the airport, and the runoff eventually reaches this portion of the Nashua River where the direction of river flow is from south to north. Several SAs are associated with this part of the Nashua River, including SAs 19, 20, and 21 at the sewage treatment plant, and SA 30 and SA 31 at the Moore Army Airfield.

As proposed in the Supplemental Work Plan, a total of eight locations were sampled at this section of the Nashua River. Both sediment and water were collected at each location. Figure 1-1 shows the locations of the sampling points for the northern section of the Nashua River.

1.4.2 Central Section of the Nashua River

This section of the Nashua River runs from the junction of Route 2 and the river to the junction of West Main Street and the river. Flow is from south to north. Runoff is collected from the western side of the Main Post of Fort Devens. Storm sewer systems #24 through #31 drain into this section of the Nashua River. A number of SAs may impact the storm drains that are associated with the river: 43L, 43M, 43N, 43O, 43P, 13, and 45. To the west of the river are SAs 10, 43S, 51, 55 and AOC 11. The following AREEs may impact the storm drains that are associated with the river: 61N, 61Q, 63Y, 63AJ, 63AI, 63AG, 69B, 61BB, 61BC, 61V, 69F, 61T, 61S, and 61AN. Only AOC 11 is located adjacent to the river. All other SAs and AREEs are associated with the storm drains discharging to the river.

As proposed in the Supplemental Work Plan, a total of eight locations were sampled in the central section of the Nashua River. At each location, both sediment and water were collected. Figure 1-2 shows the location of the sample points.

1.4.3 Cold Spring Brook

Cold Spring Brook is a small brook that collects runoff from the northeastern area of the Main Post of Fort Devens. The brook flows northeast from the magazine area, and exits the base east of Barnum Gate. The brook drains a variety of land use areas. The southern section of the brook collects runoff from the magazine area and the Cold Spring Brook landfill. It then flows north through woodlands and wetlands, collecting runoff from the industrial area along Barnum Road. Storm sewer systems #1 through #4; #6 through #9; and #16; and #17 drain into Cold Spring Brook. A number of AOCs and SAs are also associated with the storm drains discharging to this brook, including: AOC 40 associated with the Cold Spring Brook landfill study, SAs 38 and 57, and AOCs 44 and 52. The following AREEs may potentially impact the storm drains associated with Cold Spring Brook: 61B, 61AU, 61X, 69AU, 61AA, 69AN, 69AS, 69AT, 61D(AP), 61AV, 61AX, 61AY, 63F, and 69S. Only SA 57 is known to have had a direct discharge to Cold Spring Brook. All of the other AOCs, SAs, and AREEs are associated with storm drains discharging to the brook.

The Supplemental Work Plan proposed six sediment and water samples to be collected from the brook. A total of six sediment and seven water samples were collected. This discrepancy is due to the addition of an extra sampling location specifically targeted at the location where SA 57 impacts the brook. At the northernmost sample location of the brook, it was impossible to collect a sediment sample due to the low flow velocity and the presence of very thick weed growth. Figure 1-3 shows the sample point locations for Cold Spring Brook.

1.4.4 Willow Brook

Willow Brook is a seasonal brook that drains Robbins Pond. It is located in the central area of the Main Post. Willow Brook was mostly dry during the sampling period, but flow is normally to the north, where it exits the Main Post east of Verbeck Gate. Willow Brook collects runoff primarily from residential areas. However, towards the northern section of the brook, some runoff enters the brook from an industrial area to the south of the Shepley Hill Landfill. Storm sewer systems #11, #12, and #19 through #23 drain into Willow Brook. A number of SAs are associated with storm drains discharging to Willow Brook, including: SAs 33, 34, and 35. The following AREEs may potentially impact the storm drains associated with Willow Brook: 61BD, 61AB, 61A, 61AD, 63A, 63B, 61BF, 61AO, 61AH, 61C, 61AZ, 61AQ, 61AI, 61AR, 61F, 61AW, 69R, 61AK, and 61AL. None of these SAs or AREEs are located directly on Willow Brook. All of these SAs and AREEs are associated with storm sewer systems that discharge to the brook.

The Supplemental Work Plan proposed eight sediment and water samples to be collected. Due to unusually dry conditions during the sampling period, only two

water samples were collected. Most of Willow Brook had either no flow or inadequate flow to collect adequate volumes of water samples. Prior to sampling Willow Brook, samples were collected from outfalls of storm sewer systems #21 and #12; therefore, only five of the originally planned six sediment samples were collected from the brook. Figure 1-4 shows the locations of the sample points.

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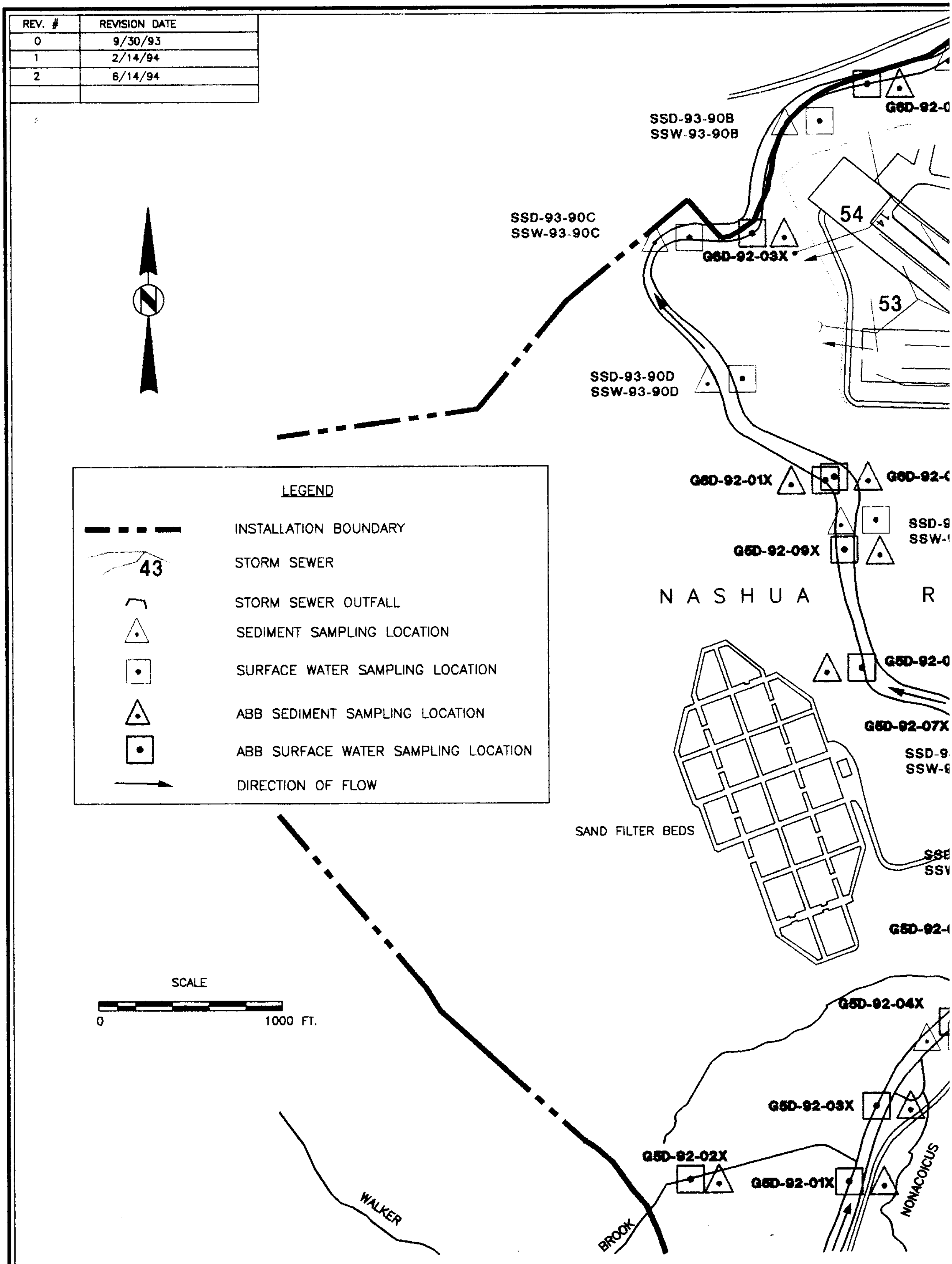
1	2/14/94
2	6/14/94



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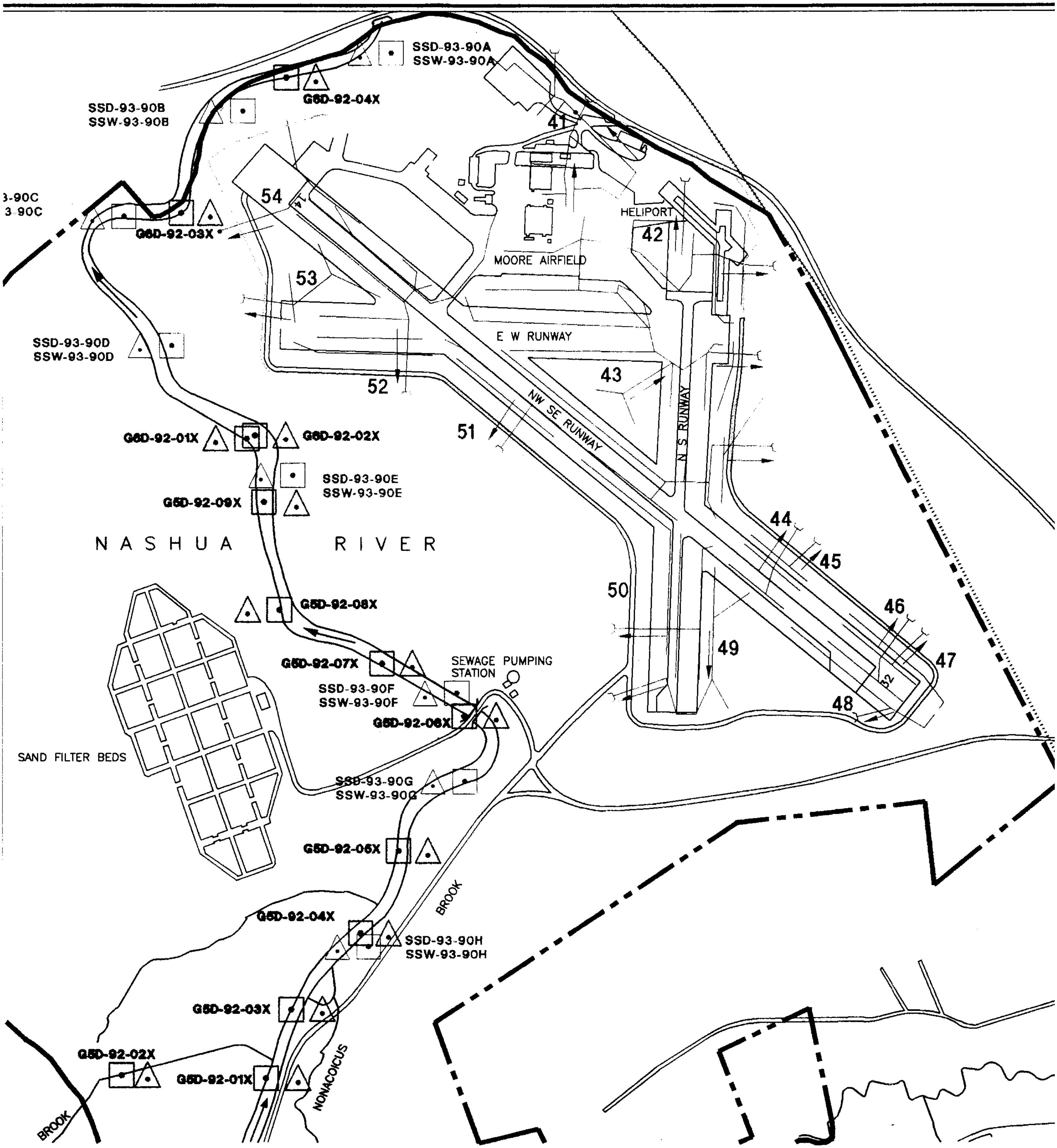
DATE: JUNE 1994	SCALE: AS SHOWN	DWG. NO. 67065-107	APPROVED BY:



DWG. NO. 67065–107	DRAWN BY: APPROVED BY:	Arthur D Little Cambridge, Massachusetts	FIGURE 1–1 NASHUA RIVER – NOR 1992 AND 1993 SAMPLI

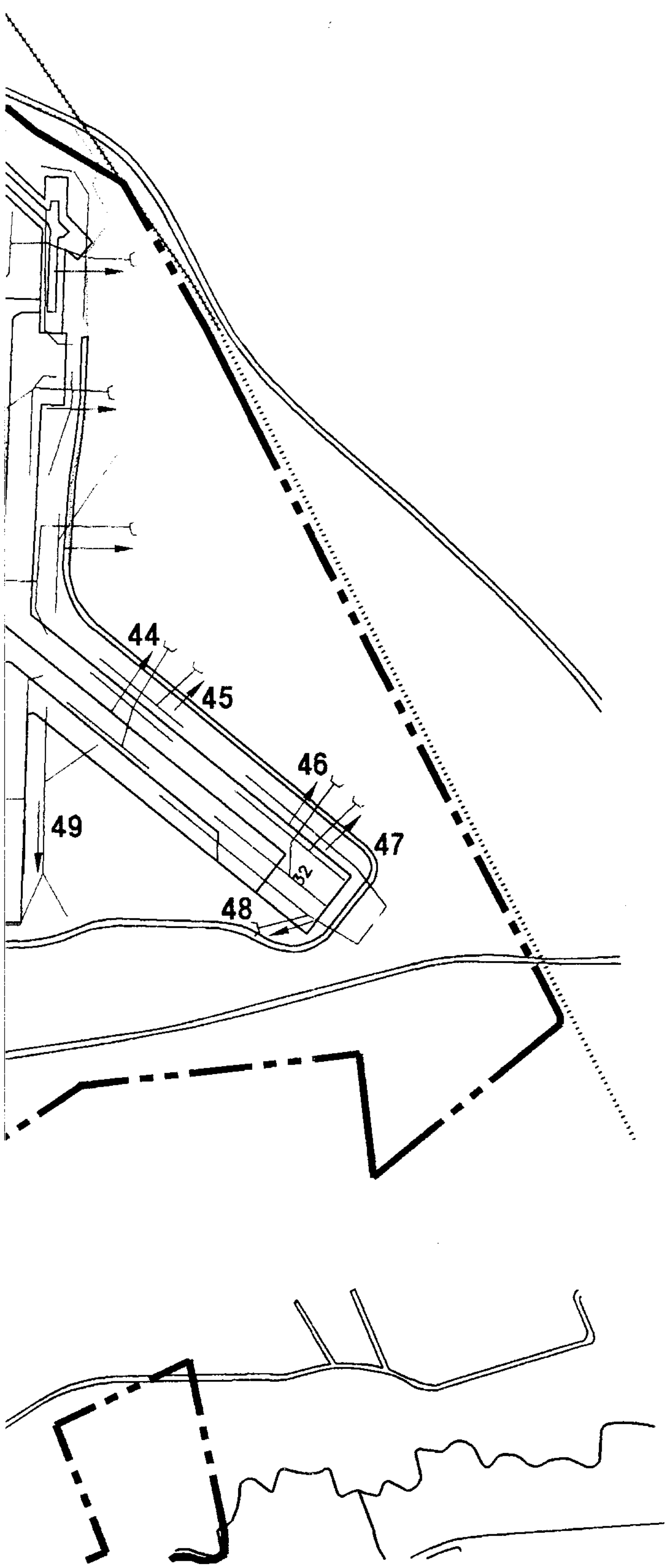


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FIGURE 1-1
NASHUA RIVER - NORTH SECTION
1992 AND 1993 SAMPLING LOCATIONS

REV. #	REVISION DATE
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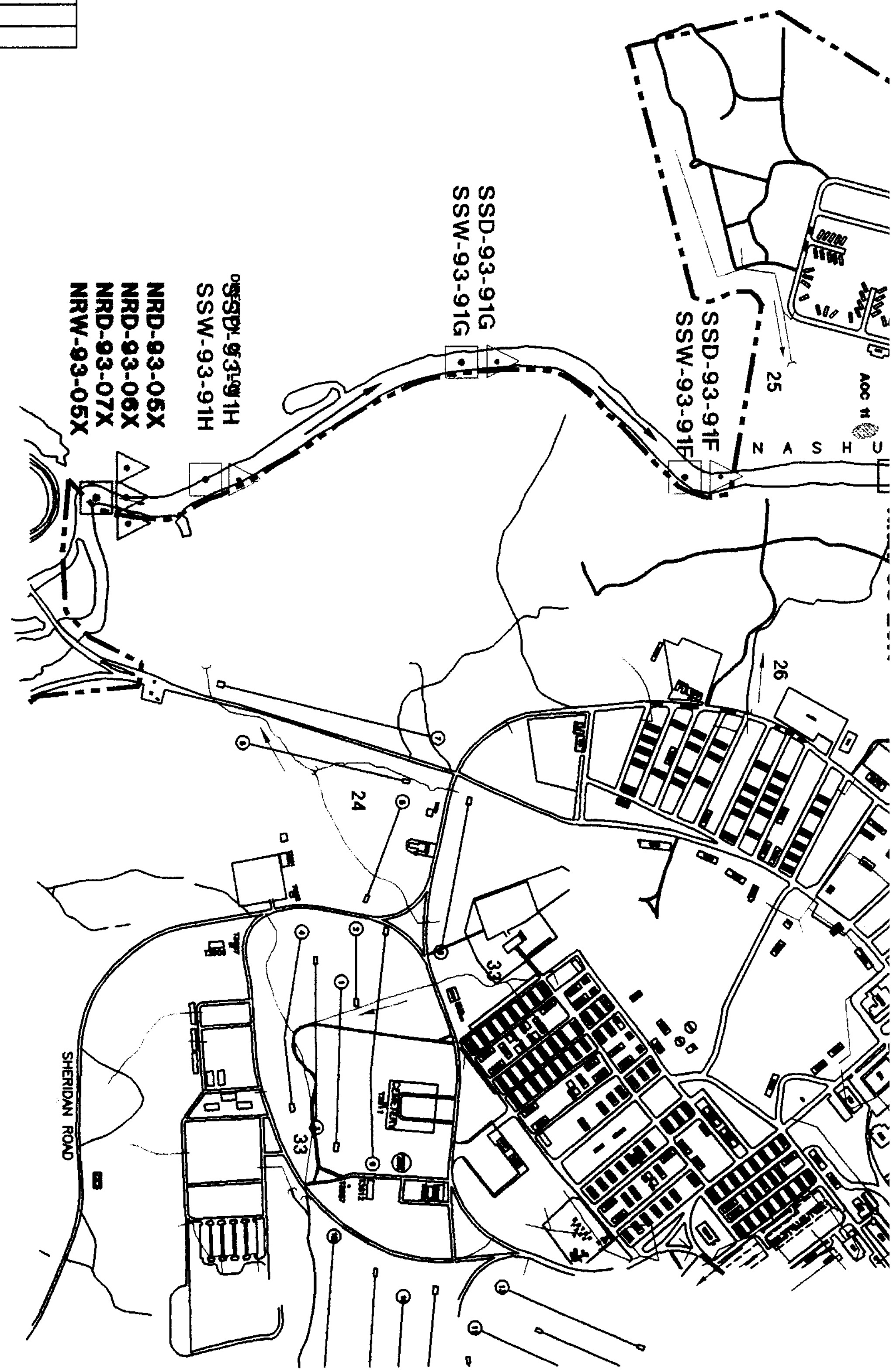
1	1/24/93
2	6/14/94



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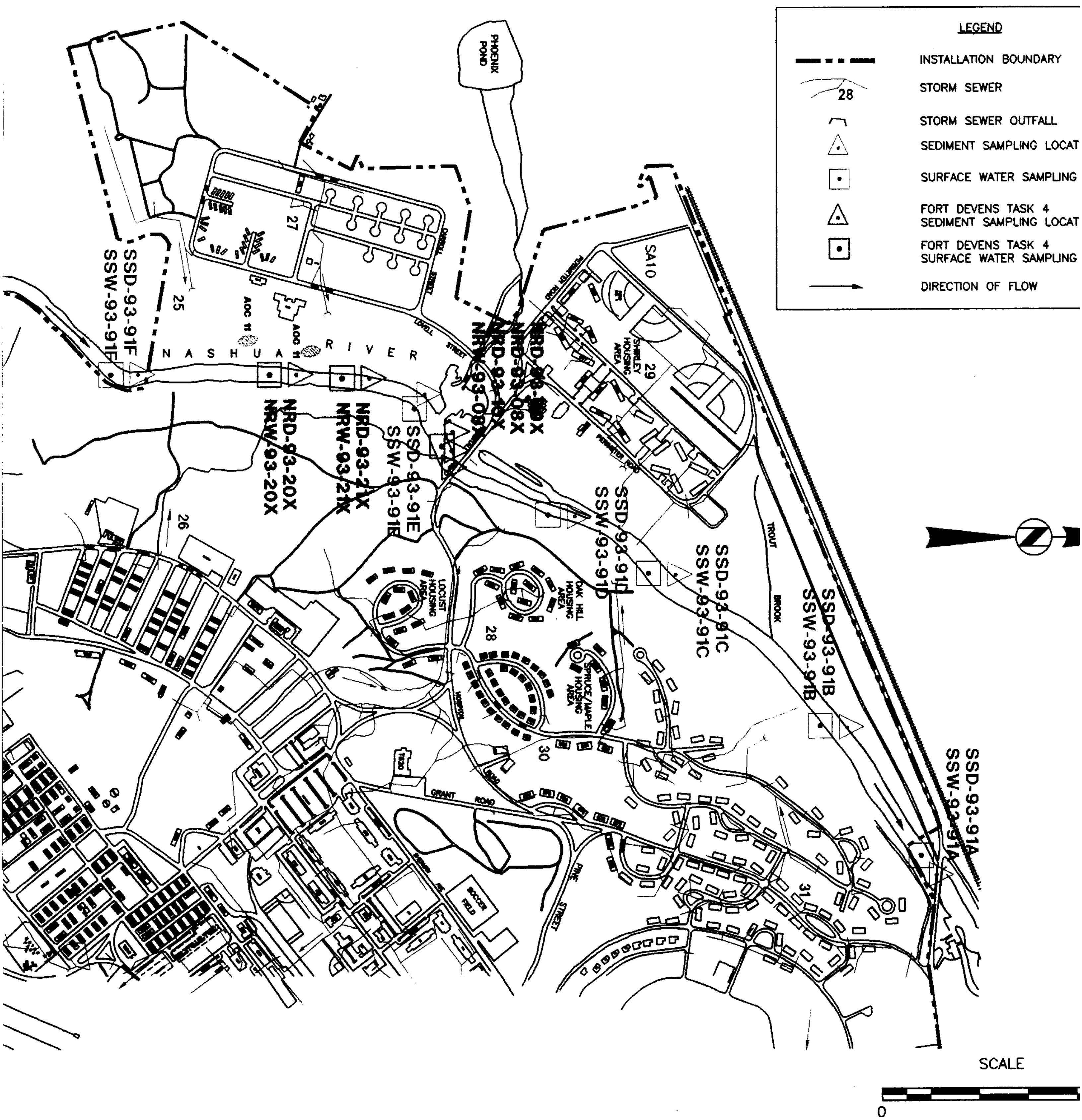
DATE: JUNE 1994	SCALE: AS SHOWN	DWG. NO. 67065-109	APPROVED



	DRAWN BY:		FIGURE 1-2
DWG. NO. 67065-109	APPROVED BY:	Arthur D Little Cambridge, Massachusetts	NASHUA RIVER - CENTRAL S 1992 AND 1993 SAMPLING LO

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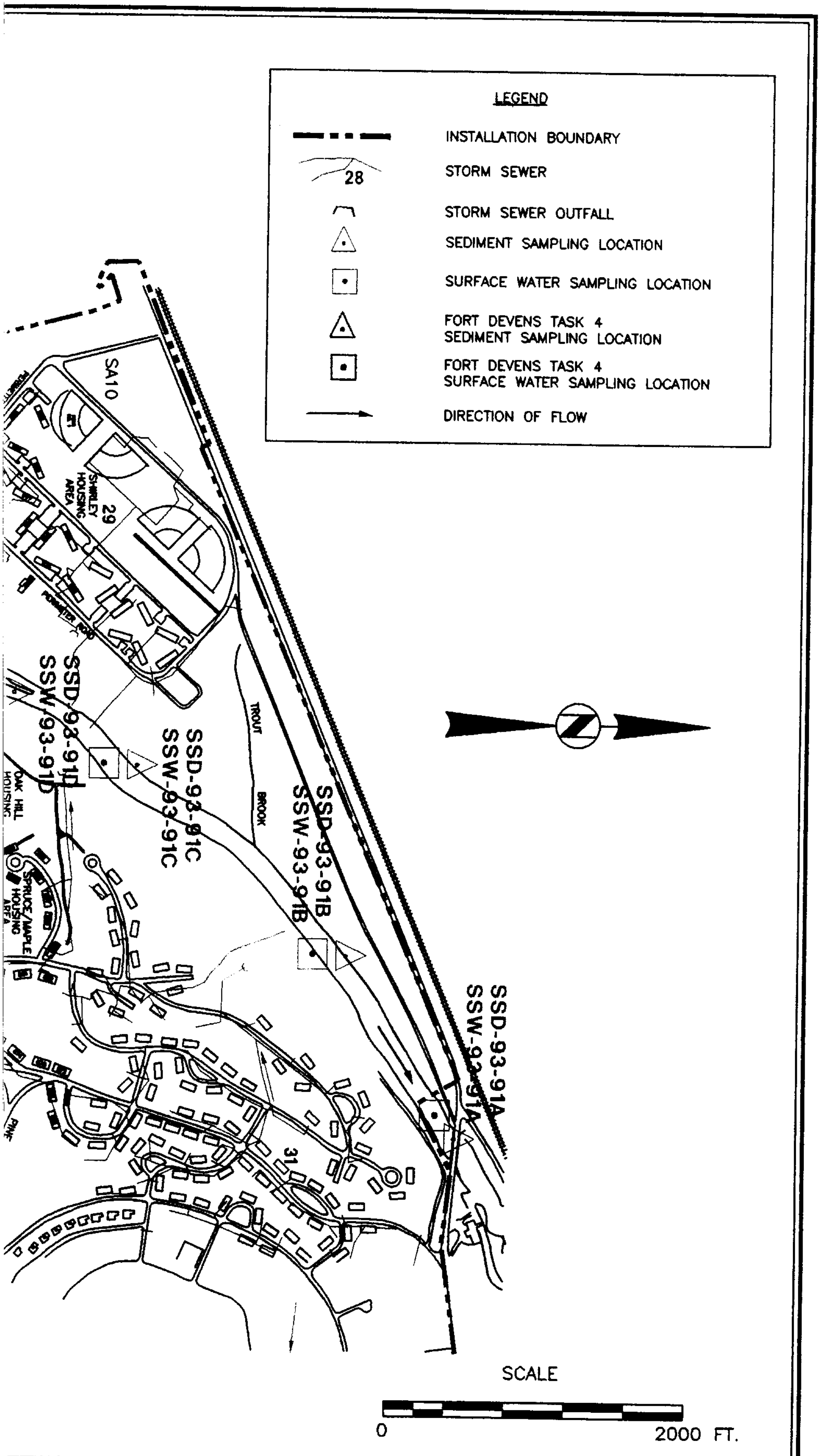

FIGURE 1–2
NASHUA RIVER – CENTRAL SECTION
1992 AND 1993 SAMPLING LOCATIONS

REV. #	REVISION DATE
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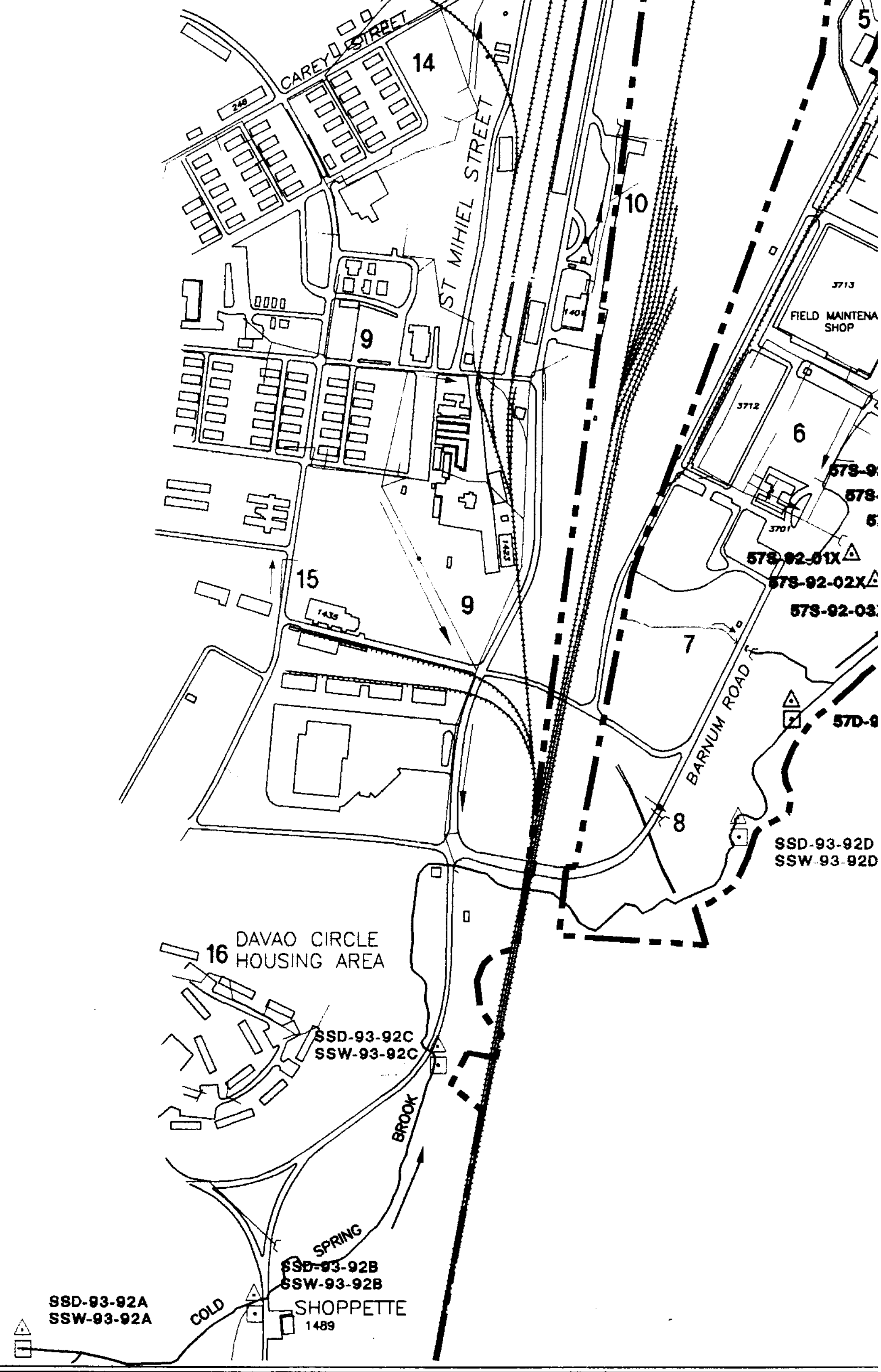
2	6/14/94



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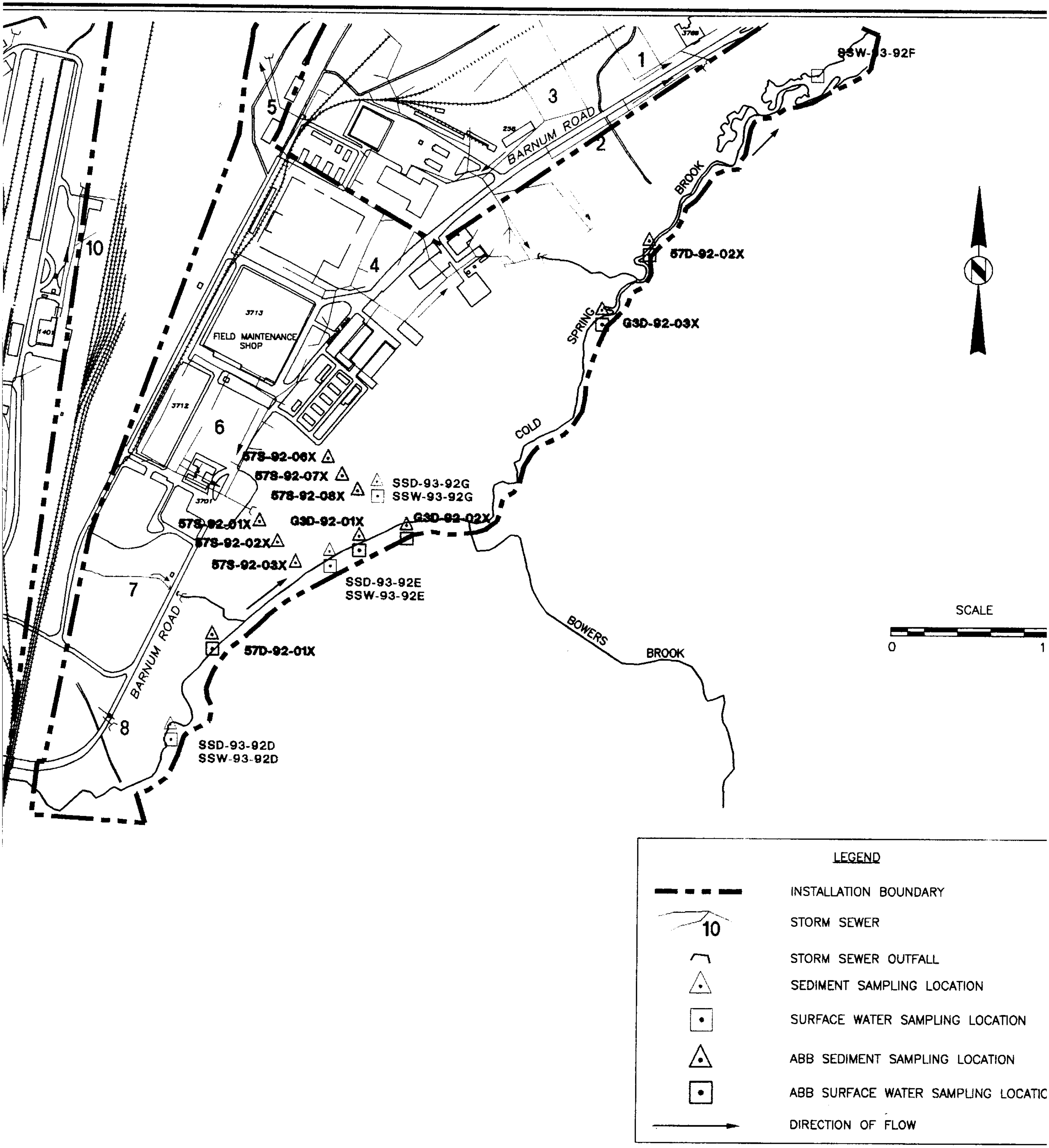
DATE: JUNE 1994	SCALE: AS SHOWN	DWG. NO. 67065-106	APPROVED



DWG. NO. 67065–106	DRAWN BY: APPROVED BY:	Arthur D Little Cambridge, Massachusetts	FIGURE 1–3 COLD SPRING BRO 1992 AND 1993 SAMPLING

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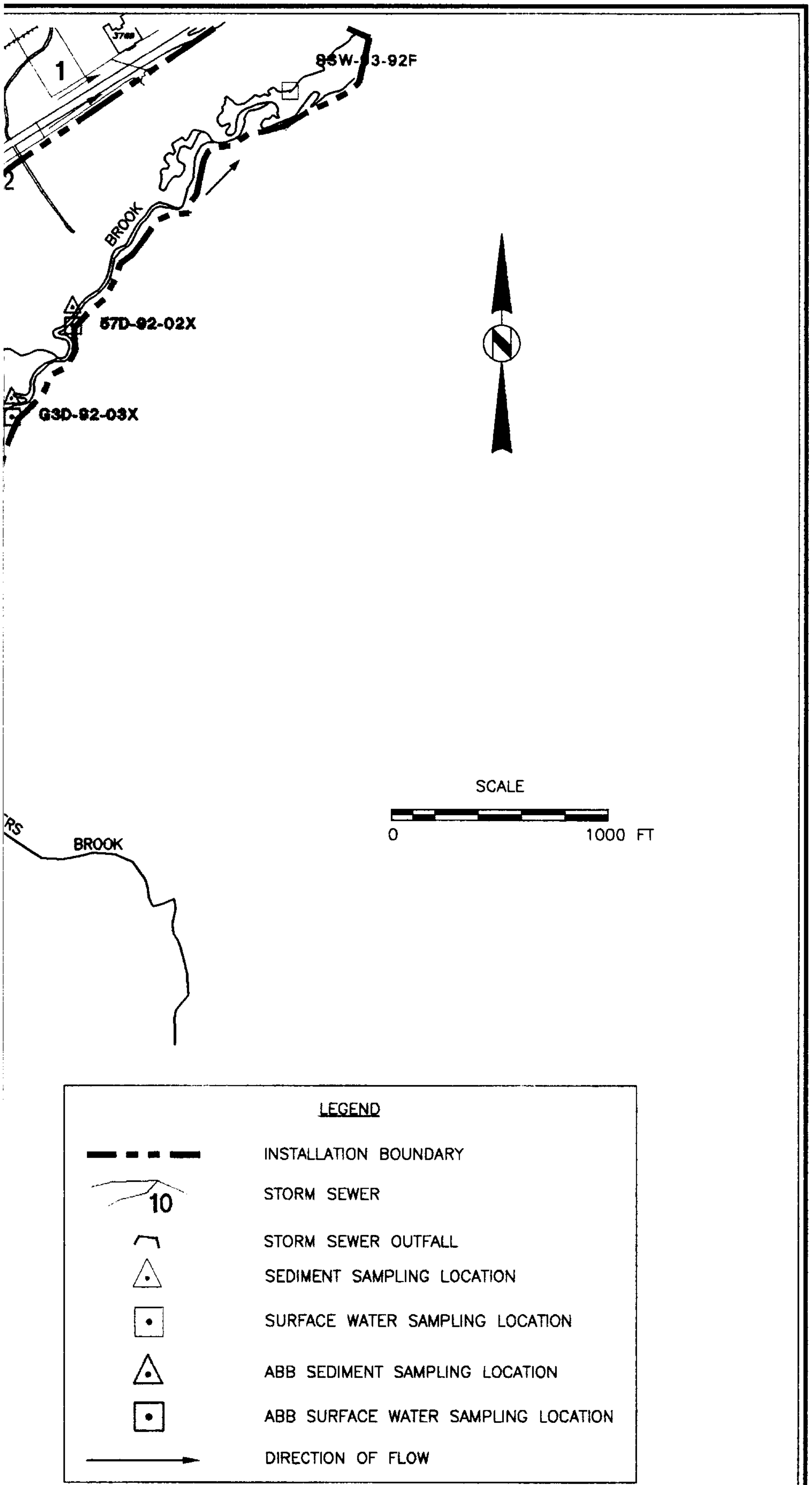

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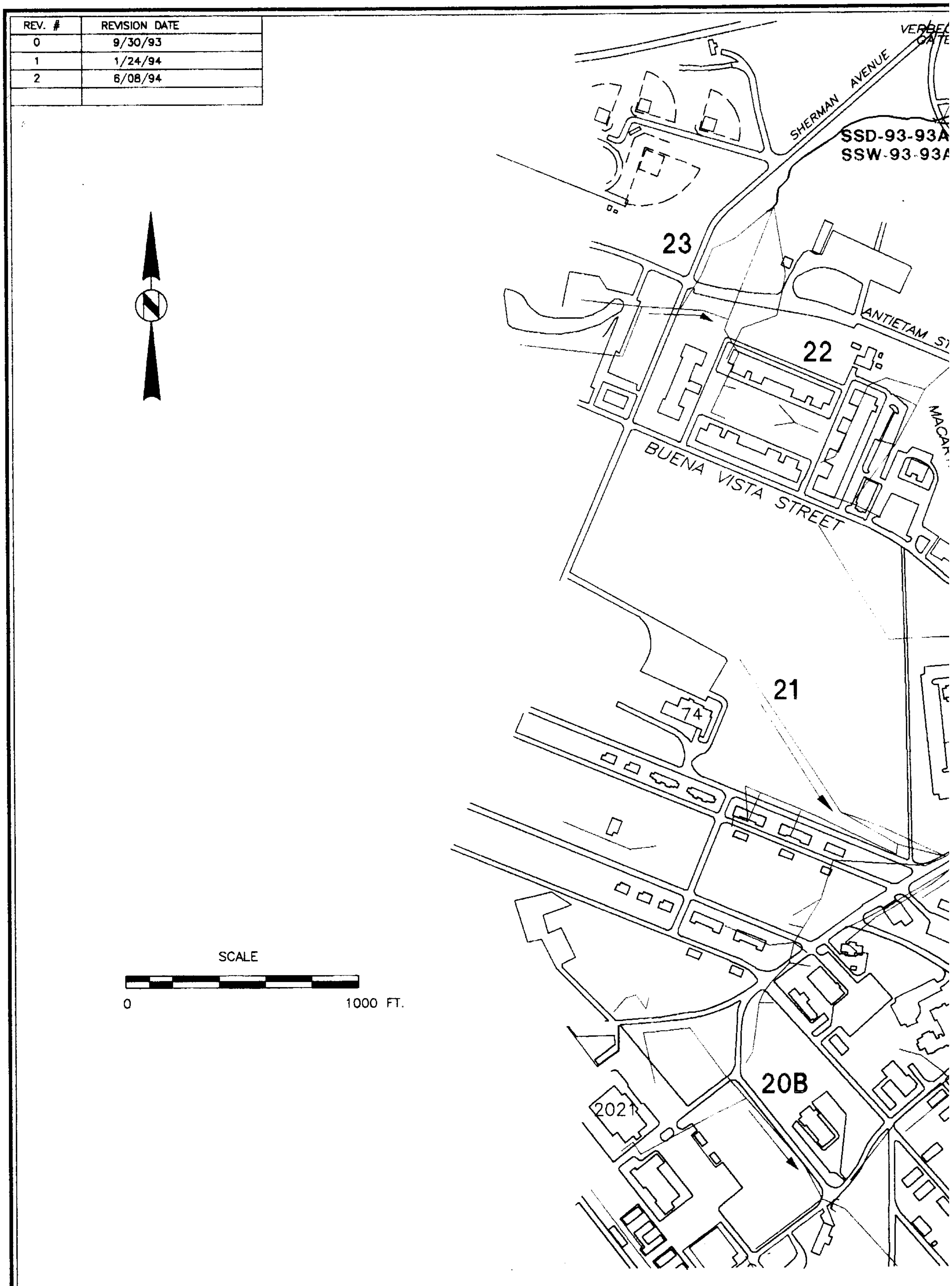
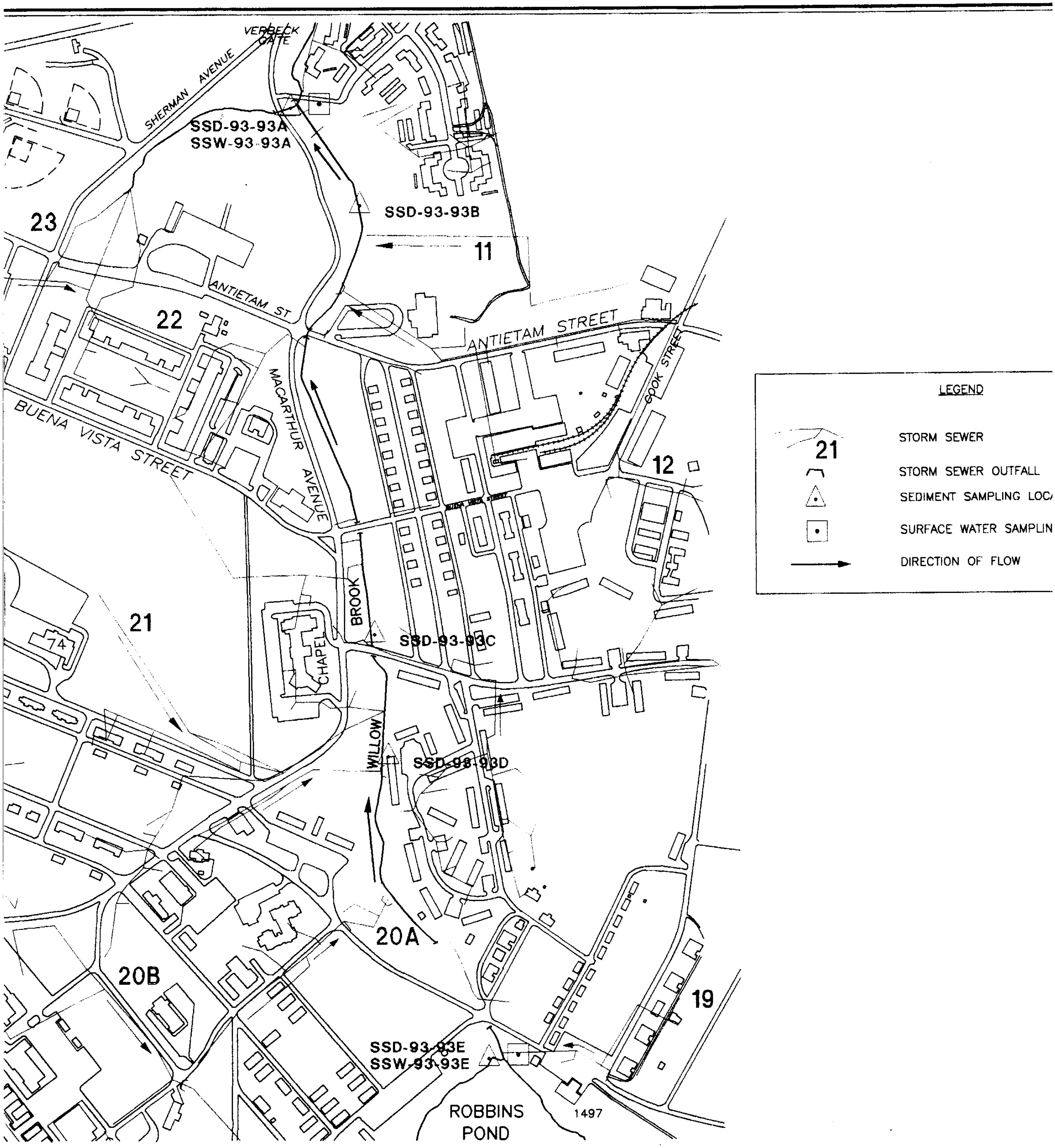
FIGURE 1-3
COLD SPRING BROOK
1992 AND 1993 SAMPLING LOCATIONS

REV. #	REVISION DATE
0	9/30/93
1	1/24/94
2	6/08/94

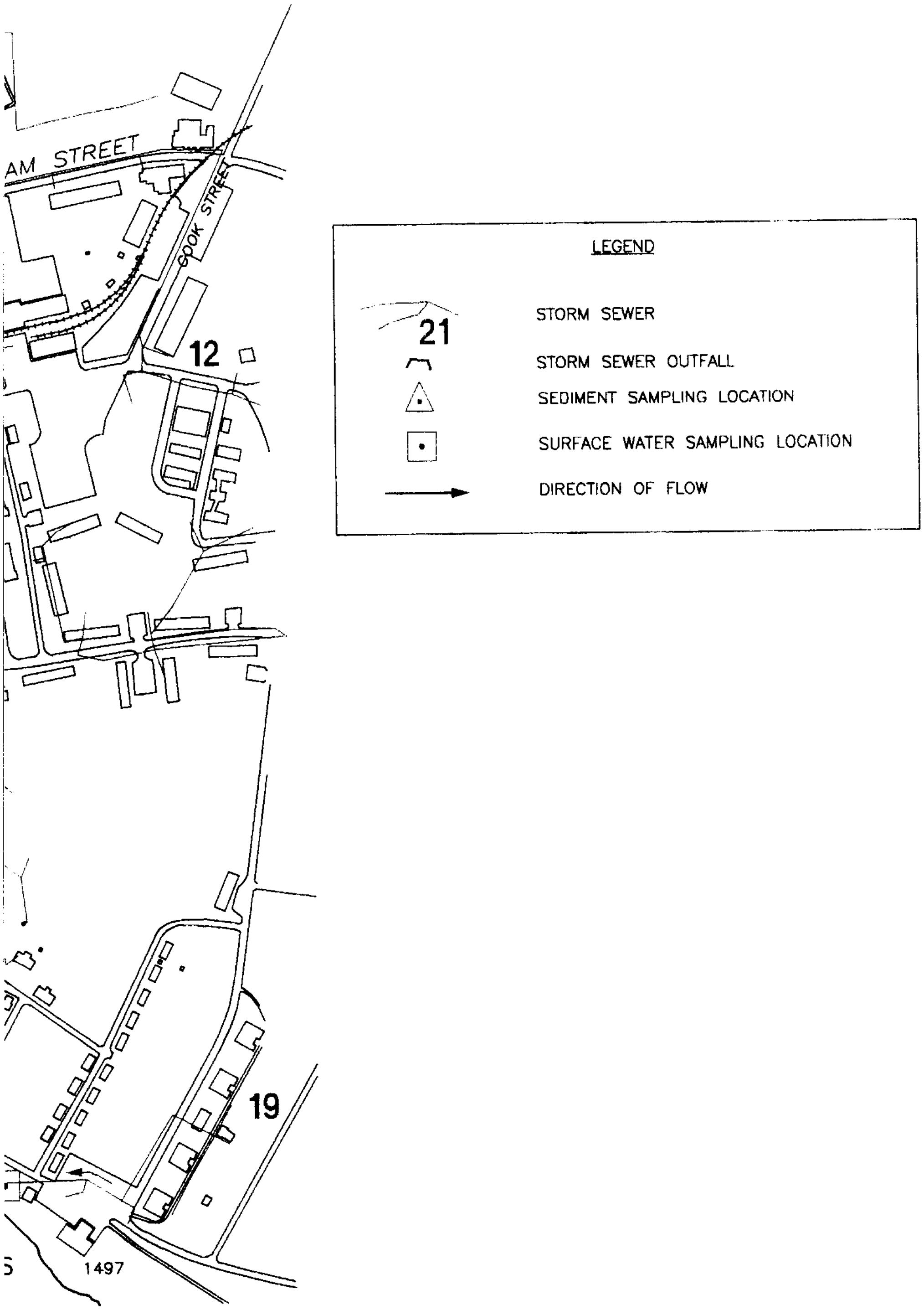


PREPARED FOR: USAEC		DRAWN BY:
DATE: JUNE 1994	SCALE: AS SHOWN	DWG. NO. 67065-108	APPROVED BY



	DRAWN BY:	**Arthur D Little** *Cambridge, Massachusetts*	FIGURE 1-4
DWG. NO. 67065-108	APPROVED BY:		WILLOW BROOK 1993 SAMPLING LOCA

6706568TEP.a



hur D Little
ridge, Massachusetts

FIGURE 1-4
WILLOW BROOK
1993 SAMPLING LOCATIONS

2.0 Sample Analysis Results

Sediment and surface water samples were collected from the northern and central Nashua River, Willow Brook, and Cold Spring Brook at Fort Devens. All samples collected were sent to a USAEC-performance demonstrated laboratory for chemical analysis. The target analytes selected as typical of industrial operations were evaluated to identify locations where contaminants from storm drains may be impacting the river/brooks. Each of the sections of the Nashua River, Willow Brook, and Cold Spring Brook had a combination of individual detections of increased concentrations of target analytes. All data from this study have been evaluated in conjunction with data from previous studies, and contaminant profiles of each of the systems have been generated. These profiles, provided as Figures 2-1 through 2-16, detail analyte concentrations along each system. These profiles establish locations of elevated contaminants and identify potential sources of contamination. Not every contaminant selected for evaluation is graphed. Graphs were not produced if the contaminants were either not detected or not present in enough samples to identify a clear trend.

2.1 Northern Section of the Nashua River

The sediment and water samples collected from the northern section of the Nashua River in 1993 contained low concentrations of the target compounds. Analysis of the combined 1992 and 1993 sediment results from this and the ABB study shows a combined peak concentration of lead, nickel, and zinc at sample location G6D-92-01X, as shown in Figure 2-1. Chromium was detected at the highest concentration at location G6D-92-04X in 1992, as shown in Figure 2-2. No other trends were identified from the metals analysis results. Concentrations of TPH were detected throughout this section of the river, as shown in Figure 2-3. A peak TPH concentration was detected at sample location G6D-92-01X in 1992, but levels seemed generally lower in the 1993 data. SVOCs, notably fluoranthene, phenanthrene, and pyrene, were detected at low concentrations throughout this section of the river. Benzo(a)anthracene and benzo(a)pyrene were not detected in sediments in the north section of the Nashua River. Figure 2-4 shows the concentration profile of phenanthrene along this section of the river. Fluoranthene and pyrene are not graphed because these compounds were only detected in low concentrations and not detected in every sample. Toluene was also detected at low concentrations throughout this section of the river. Dichlorobenzenes were detected in sample G5D-92-01X. The following organic acids were detected in sample G6D-92-01X: palmitic, hexadecanoic, stearic, and octadecenoic acids. Proviscol wax and promulsin were also detected. Very low levels of the pesticide DDD were detected throughout the sediment samples collected from this section of the river, with the highest concentration occurring in sample SSD-93-90E.

System #54 is the only storm sewer system directly discharging to the northern section of the Nashua River. All of the other systems associated with this portion of the river discharge to the river through wetlands or through undefined drainage swales. As a result, only system #54 is indicated on the analyte graphs (Figures 2-1

through 2-4). System #54 does not appear to be directly impacting the northern section of the Nashua River. Only phenanthrene and TPH concentrations detected at system #54's outfall have concentrations above the analyte concentrations detected in the river sediment samples. Both pheranthrene and TPH increase in concentration from sample G6D-92-03X to sample SSD-93-90A. The highest concentrations are at sample point SSD-93-90A. Sample point SSD-93-90A, however, is located approximately 1,500 feet downstream of sample G6D-92-03X; therefore, it is difficult to determine a correlation between these two points. Furthermore, sample SSD-93-90A is located near the Route 111 bridge.

Chemical analysis of the water samples collected from the northern section of the Nashua River showed no evidence of TPH in the water. Various metals, including lead, iron, manganese, and magnesium, occurred at low concentrations throughout this section of the river. The pesticide DDD was detected at low concentrations in all samples collected during the summer of 1993. No pesticide analyses had been performed during previous studies conducted at this section of the river. VOCs were detected in two surface water samples. SVOCs were not detected in any of the water samples. Table 2-1 shows all the analyte compound detects for the samples collected in the northern section of the Nashua River during 1993. No analyte graphs were generated for the water samples collected in the portion of the river because no clear contaminant trends could be identified from the analytes detected.

2.2 Central Section of the Nashua River

Sediments from the central section of the Nashua River contain trace levels of each of the target analytes, with concentrations generally increasing to the north (downstream). Concentrations of lead, nickel, and zinc are high at the southern portion of this section of the river, as shown in Figure 2-5. Concentrations peak again immediately downstream from AOC 11, and show another peak in the most northern sample (SSD-93-91A). Arsenic and chromium concentrations (Figure 2-6) were highest in sample NRD-93-21X. As shown in Figure 2-7, the highest concentrations of TPH were found in the sediment sample collected from location SSD-93-91A. This elevated concentration of TPH collected near the West Main Bridge, does not correlate with any associated storm water samples. SVOCs had higher concentrations and a greater number of compounds detected in the samples from the southern central portion of the river. The most commonly detected compounds are phenanthrene, benzo(a)anthracene, benzo(a)pyrene, acenaphthylene, pyrene, and chrysene. Figure 2-8 shows the profiles along this section of the river for benzo(a)anthracene, benzo(a)pyrene, and phenanthrene. Acenaphthylene, pyrene, and chrysene were not plotted on graphs. In general, there is no clear correlation between analyte concentrations (SVOCs) detected at storm sewer outfalls with analyte concentrations detected in the river samples. All SVOCs detected at the outfall are either lower than the concentrations in the river or were not detected. No VOCs were detected in the

sediment samples. Low concentrations of the pesticides DDD, endosulphan, dieldrin, and isodrin were detected in the sediment samples.

Chemical analysis of the water samples collected from this section of the Nashua River showed that they contained no significant concentrations of any analytes. No SVOCs or VOCs were detected in the water. TPH was detected at just above the analysis detection limit in only one sample. Very low concentrations of the pesticides DDD and lindane were detected in each of the water samples. Metals (barium, calcium, iron, magnesium, manganese, potassium, and sodium) were detected in all of the surface water samples. Table 2-2 shows all the analyte compound detects for the samples collected during 1993 for the central section of the Nashua River.

2.3 Cold Spring Brook

The sediment and water samples collected near the origin of Cold Spring Brook (SSD, SSW-93-92A, SSD, SSW-93-92B), east of the magazine area, show no elevated levels of target contaminants. Chemical analysis of the 1993 sediment samples collected at SSD-93-92D, immediately downstream from the wetlands, indicated elevated levels of target compounds. Sample SSD-93-92D was collected in Cold Spring Brook at the point where the industrial portion of Barnum Road starts. As a result, the increasing trend of contaminants correlates with the industrial activities performed historically and presently along the central portion of Barnum Road. Concentrations of target contaminants generally increase towards the northern section of the brook.

Two samples were collected from the pond located adjacent to Cold Spring Brook Landfill (AOC 40). The sediment and water samples showed no elevated levels of target contaminants. Concentrations of metals became elevated throughout the system downstream from sediment sample location SSD-93-92D. Concentrations of lead, zinc, nickel, aluminum, and iron become elevated at this location. Figure 2-9 shows the profile of lead, nickel, and zinc. Figure 2-10 shows the profile for arsenic and chromium. Maximum concentrations of these metals occur within samples collected from sites SSD-93-92G and 57D-92-01X. Peak concentrations of TPH are shown in Figure 2-11.

Samples were also collected in drainage swales to the west of these sample locations, as part of SA 57. Elevated concentrations of TPH were detected in each of the sediment samples collected. The detected concentrations in the drainage swale samples were more elevated compared to the concentration levels in the brook. Therefore, the TPH contamination appears to be concentrated to the west of Cold Spring Brook towards Barnum Road. SVOCs in sediment were detected at low concentrations at all sample locations except location G3D-92-03X. Figure 2-12 shows the profile of SVOCs. Benzo(a)anthracene, benzo(a)pyrene, and phenanthrene peak at sample location G3D-92-03X. This location is downstream from SA 57. A

possible source of the SVOCs could be the fuel oil released and contained under a dam at SA 57. Variation in concentrations of target SVOCs throughout SA 57 are probably due to irregular drainage patterns throughout this area. Review of all data collected in relation to this study of Cold Spring Brook and the study associated with SA 57 indicates some evidence of potential point sources of contamination associated with individual storm sewer systems and SA 57. Most evident of these associations is the occurrence of elevated concentrations of select polycyclic aromatic hydrocarbon (PAH) compounds, notably phenanthrene, benzo(a)pyrene, fluoranthene, and benze(a)anthracene in the sediment sample collected at the outfall of system #3. Adjacent to this outfall located on the Brook is sample location G3D-92-03X. This sample also contained elevated concentrations of the same PAH compounds. The exact location of G3D-92-03X appears to be upstream from the outfall of system #3. Drainage patterns are very diffuse around this area of Cold Spring Brook because the storm drain outfalls drain through undefined drainage swales and wetlands. As a result, it is difficult to associate individual outfalls with a specific sample location.

The metals selected for analyses in Cold Spring Brook have an increasing trend in concentration downstream from sample SSD-93-92D. The maximum concentration of all metals appears to be at sample G3D-92-01X. This location is immediately downstream of the outfall for system #6 and in the same area of sampling as SA 57. However, because of the increasing trend in metal concentration downstream of sample SSD-93-92D, it is unclear whether this increase in concentration is attributed to a single source or a combination of sources.

The surface water samples collected in Cold Spring Brook only detected metals and TPH. The highest concentrations of metals and TPH were at sample SSD-93-92G. There are no analyte graphs for the water samples because only sample SSD-93-92G had detects for the analytes chosen for evaluation. Table 2-3 shows all the analytes detected for the samples collected during 1993 in Cold Spring Brook.

2.4 Willow Brook

During the sampling of Willow Brook, there was very little flow of water in the brook as a result of unusually dry climatic conditions. Therefore, only two water samples were collected. The graphs of the analytes evaluated from Willow Brook do not indicate a clear trend of contamination within the brook.

Review of the chemical analysis results indicated no clear trends in the concentrations of metals within the sediment samples collected from Willow Brook. A peak concentration of chromium and zinc were detected in sample SSD-93-93D with associated low concentrations of arsenic, zinc, nickel, and lead in the same sample. Figure 2-15 shows the concentration profiles of lead, zinc, and nickel, and Figure 2-16 shows the concentration of arsenic and chromium. The highest TPH concentrations in the sediment samples were at sample location SSD-93-93D.

Figure 2-13 shows the concentration profile for TPH. SVOCs, notably benzo(a)anthracene, pyrene, and chrysene, had the highest concentrations in sample SSD-93-93D. Phenanthrene was also detected at this sample location, but had its highest concentration at sample SSD-93-93B. Figure 2-14 shows the concentration profiles for benzo(a)anthracene and phenanthrene. To the north, at sample locations SSD-93-93A, B and C, trace levels of SVOCs and the pesticide DDD were detected. No VOCs were detected in any of the sediment samples. No evidence of SVOCs or VOCs were detected in the two water samples collected from the system. Low concentrations of TPH were detected in the water samples collected from the brook. Table 2-4 shows all the analyte compound detects for the samples collected during 1993 for Willow Brook.

Sample location SSD-93-93D is located between the sample locations of the outfalls of system #21. Three samples from manholes were collected as part of the system #21 sampling within Willow Brook. As noted on Figures 2-13, 2-14, and 2-15, the elevated concentrations of metals, SVOCs, and TPH correlate with the concentrations detected in samples SSD-93-21A, B, and D. Phenanthrene was elevated at sample point SSD-93-93B, which was downstream of systems #11 and #12. However, it is unclear if this sample correlates with systems #11 and #12 or is attributed to sediment deposition. Chromium concentrations were elevated downstream of system #23 outfall, but the concentration of chromium in system #23 is lower than the concentration detected in Willow Brook.

Figure 2-1

Nashua River, Northern Section
Lead/Nickel/Zinc in Sediment

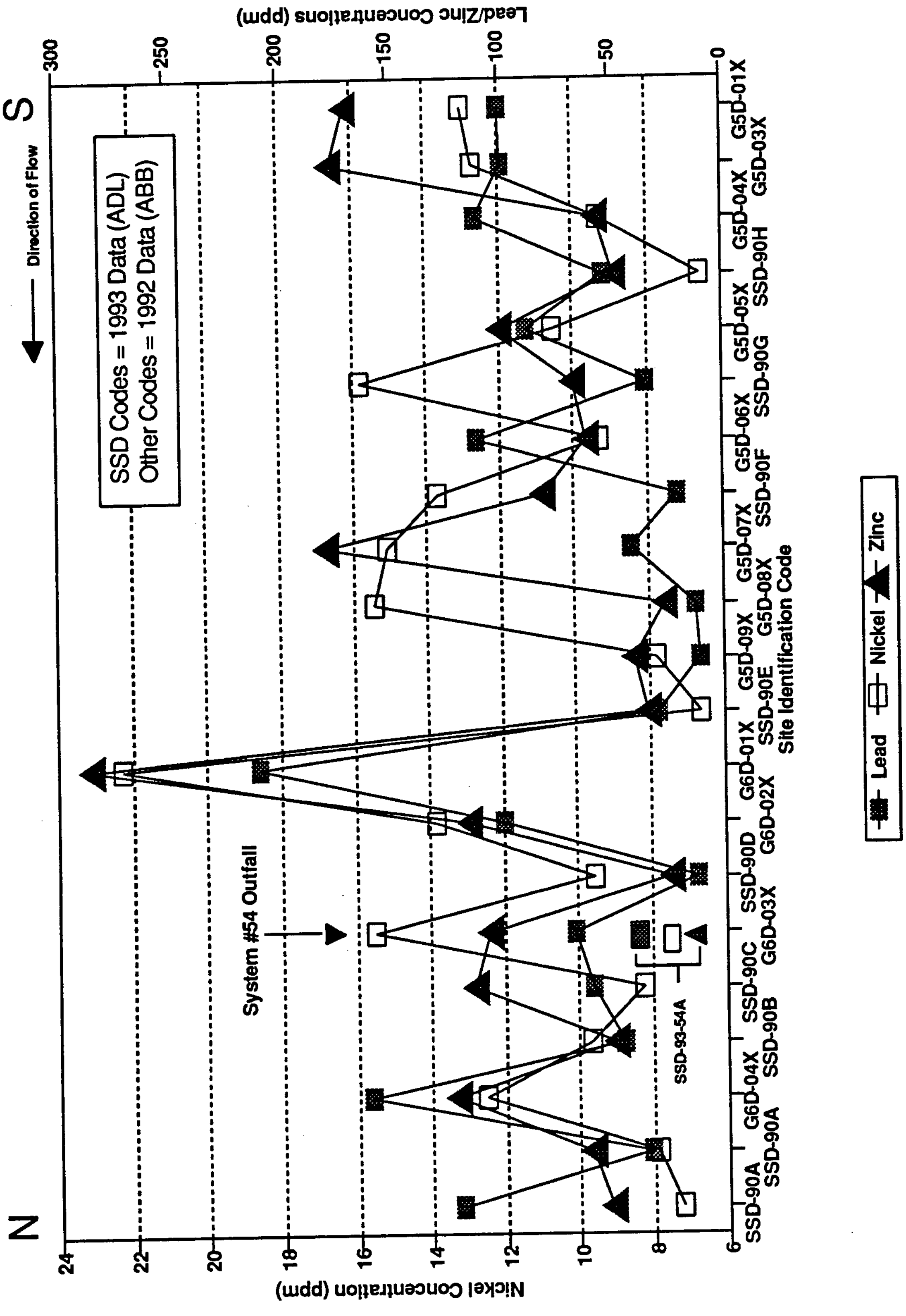


Figure 2-2

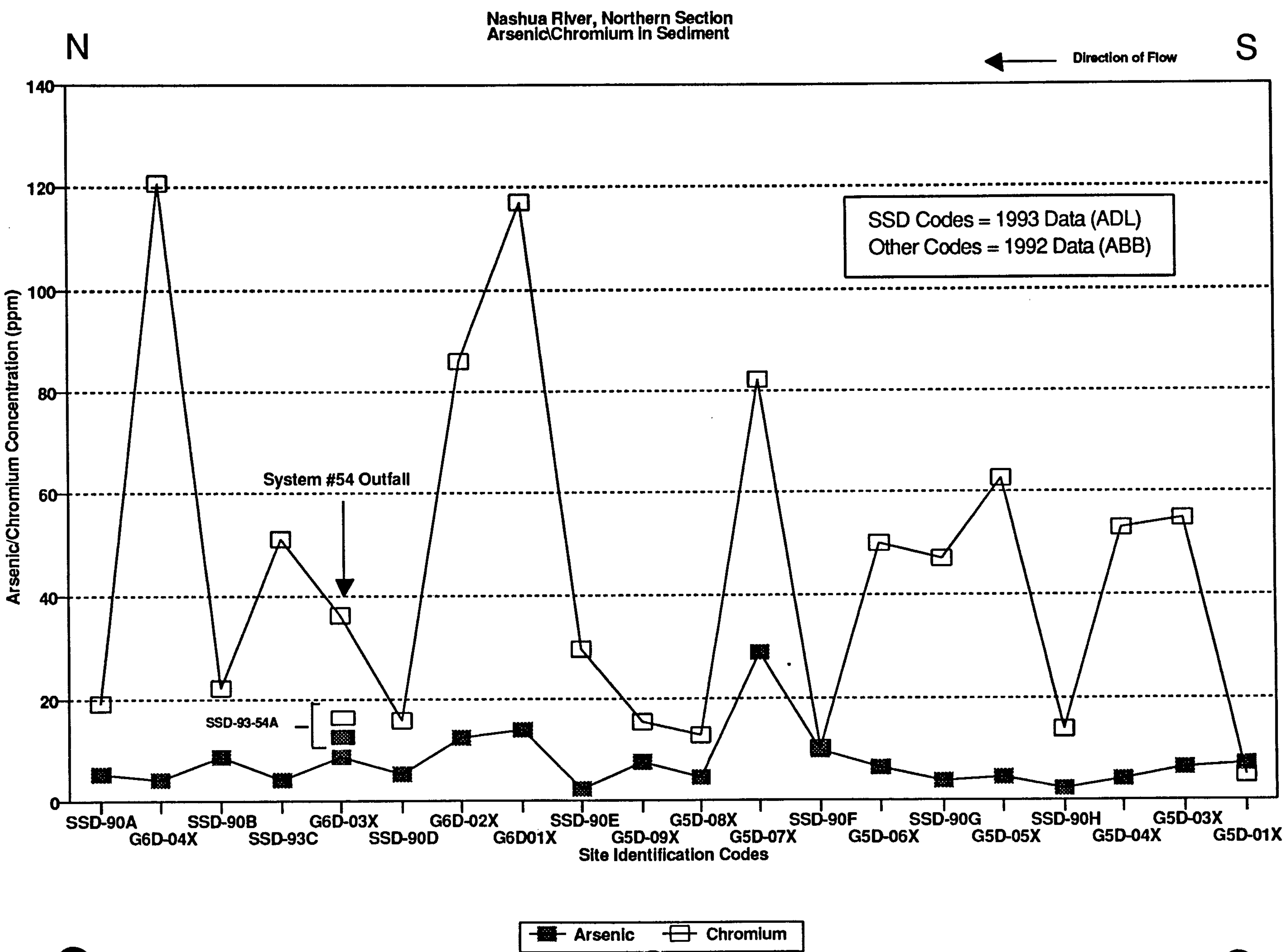

Nashua River, Northern Section
Arsenic\Chromium in Sediment
N
S
Direction of Flow
SSD Codes = 1993 Data (ADL)
Other Codes = 1992 Data (ABB)
System #54 Outfall
SSD-93-54A
Arsenic/Chromium Concentration (ppm)
140
120
100
80
60
40
20
0
SSD-90A
G6D-04X
SSD-90B
SSD-93C
G6D-03X
SSD-90D
G6D-02X
G6D01X
SSD-90E
G5D-09X
G5D-08X
G5D-07X
SSD-90F
G5D-06X
SSD-90G
G5D-05X
SSD-90H
G5D-04X
G5D-03X
G5D-01X
Site Identification Codes
Arsenic
Chromium

Figure 2-3

Nashua River, Northern Section
TPH/TOC in Sediment

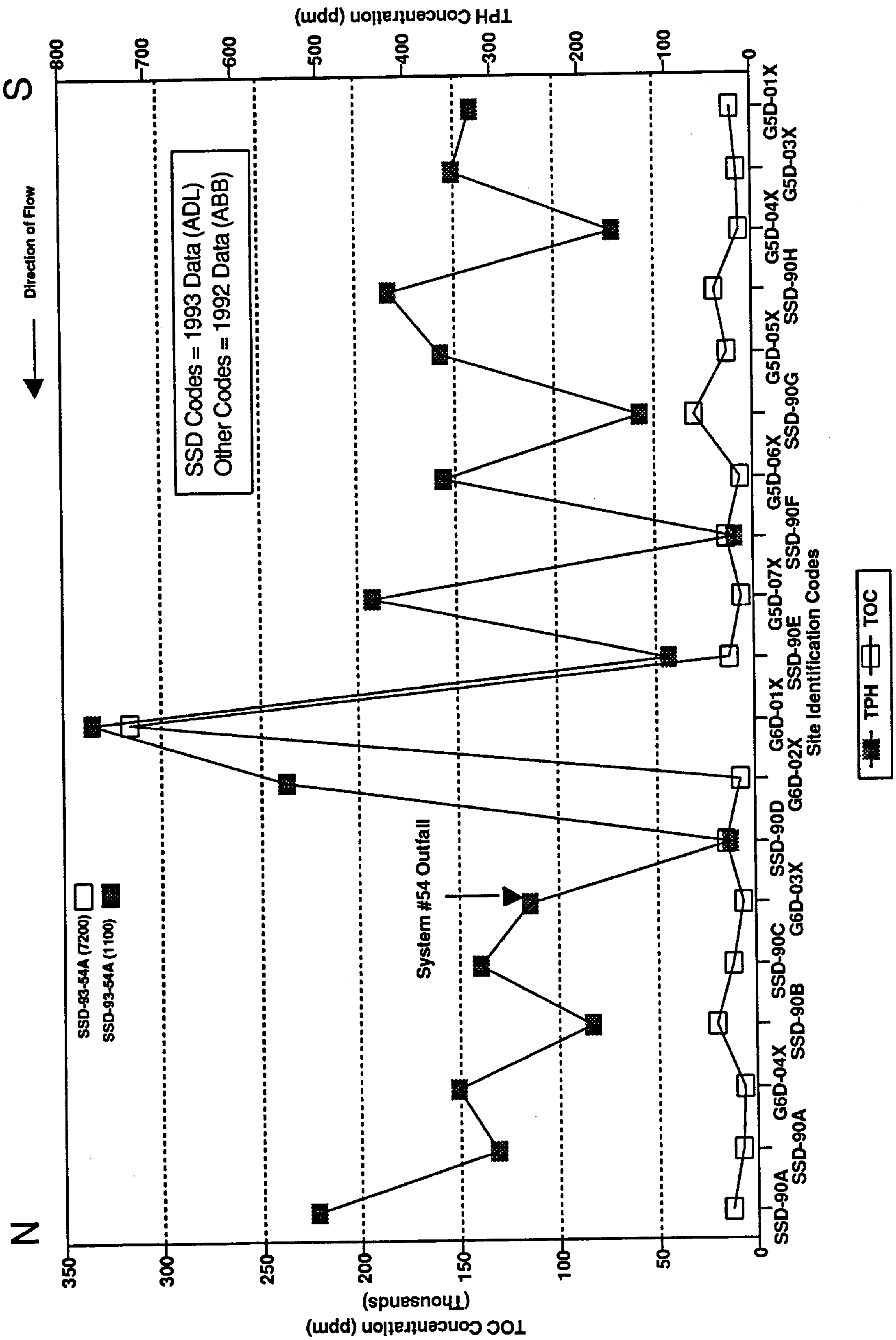


Figure 2-4
Nashua River, Northern Section
Phenanthrene in Sediments

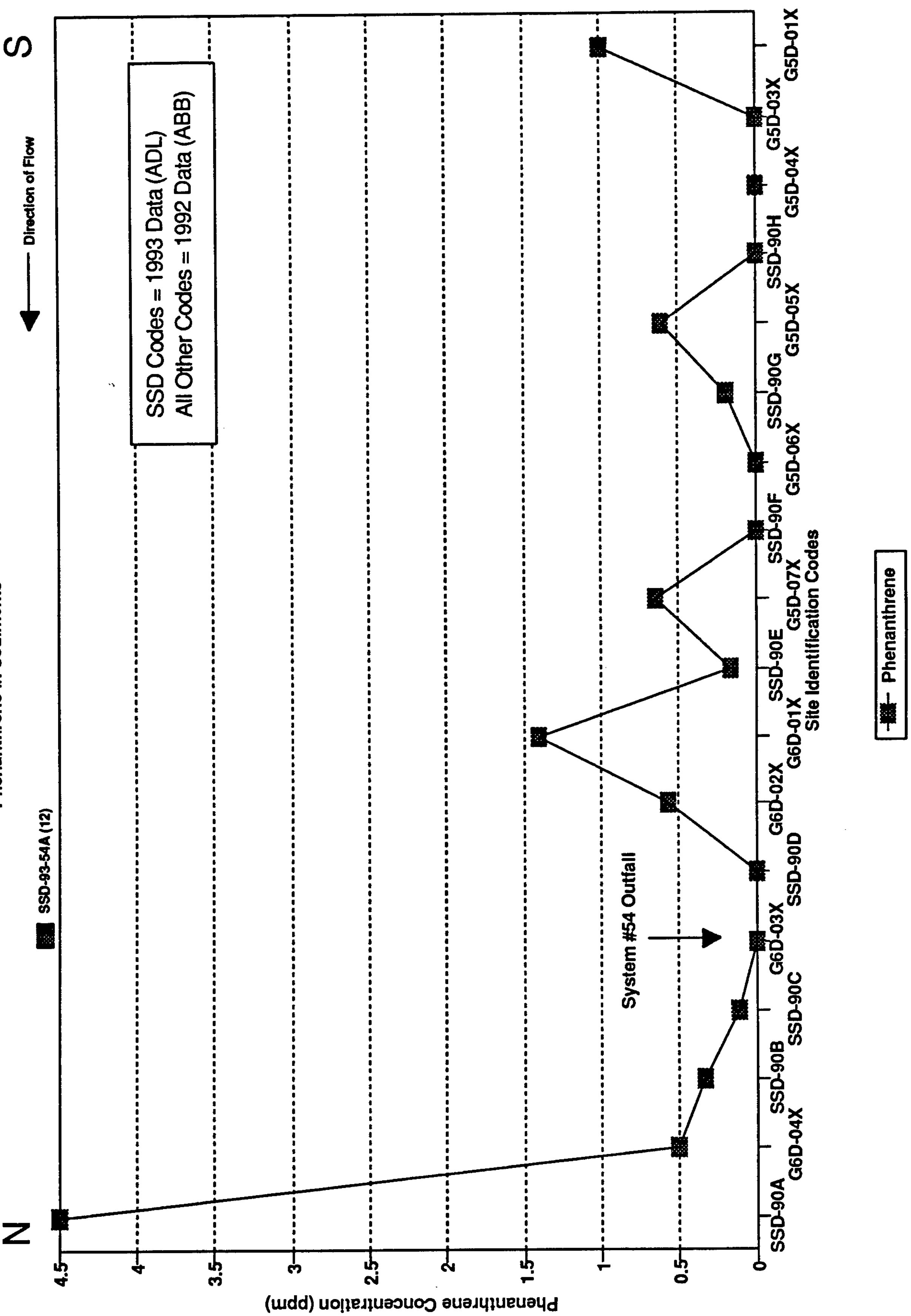


Figure 2-5

Nashua River, Central Section
Lead/Nickel/Zinc in Sediment

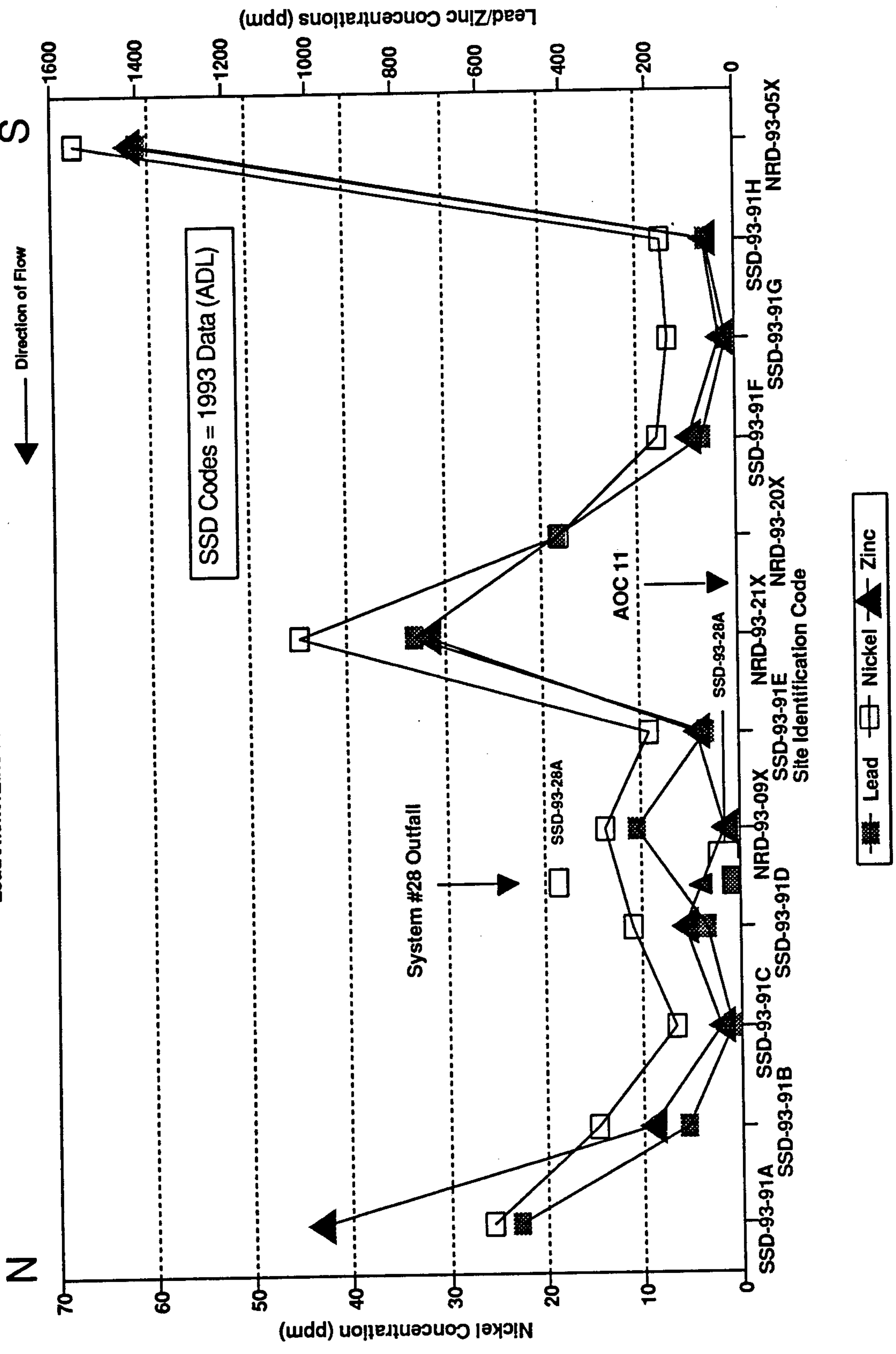


Figure 2-6

Nashua River, Central Section
Arsenic\Chromium in Sediment

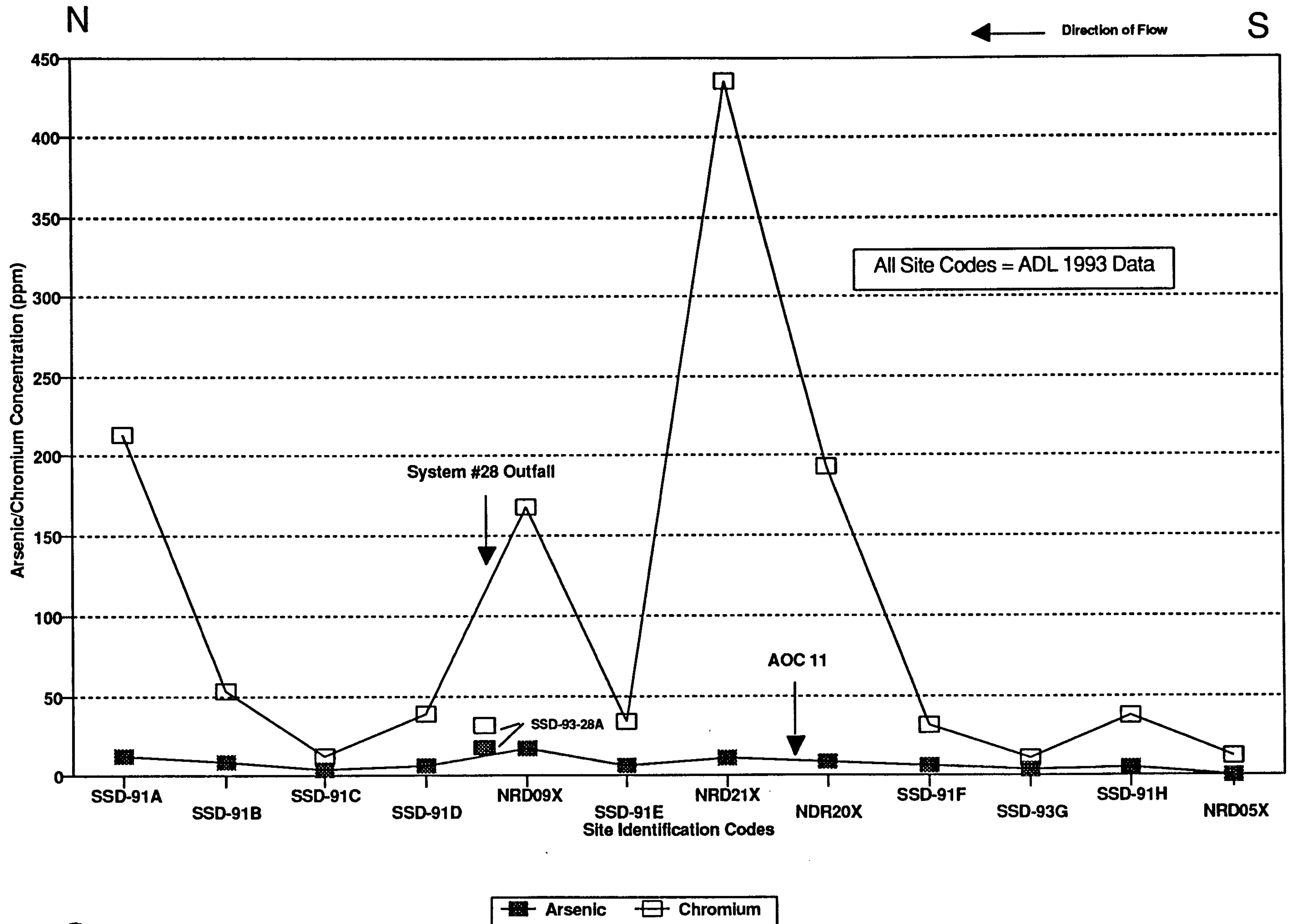


Figure 2-7

Nashua River, Central Section
TPH/TOC in Sediment

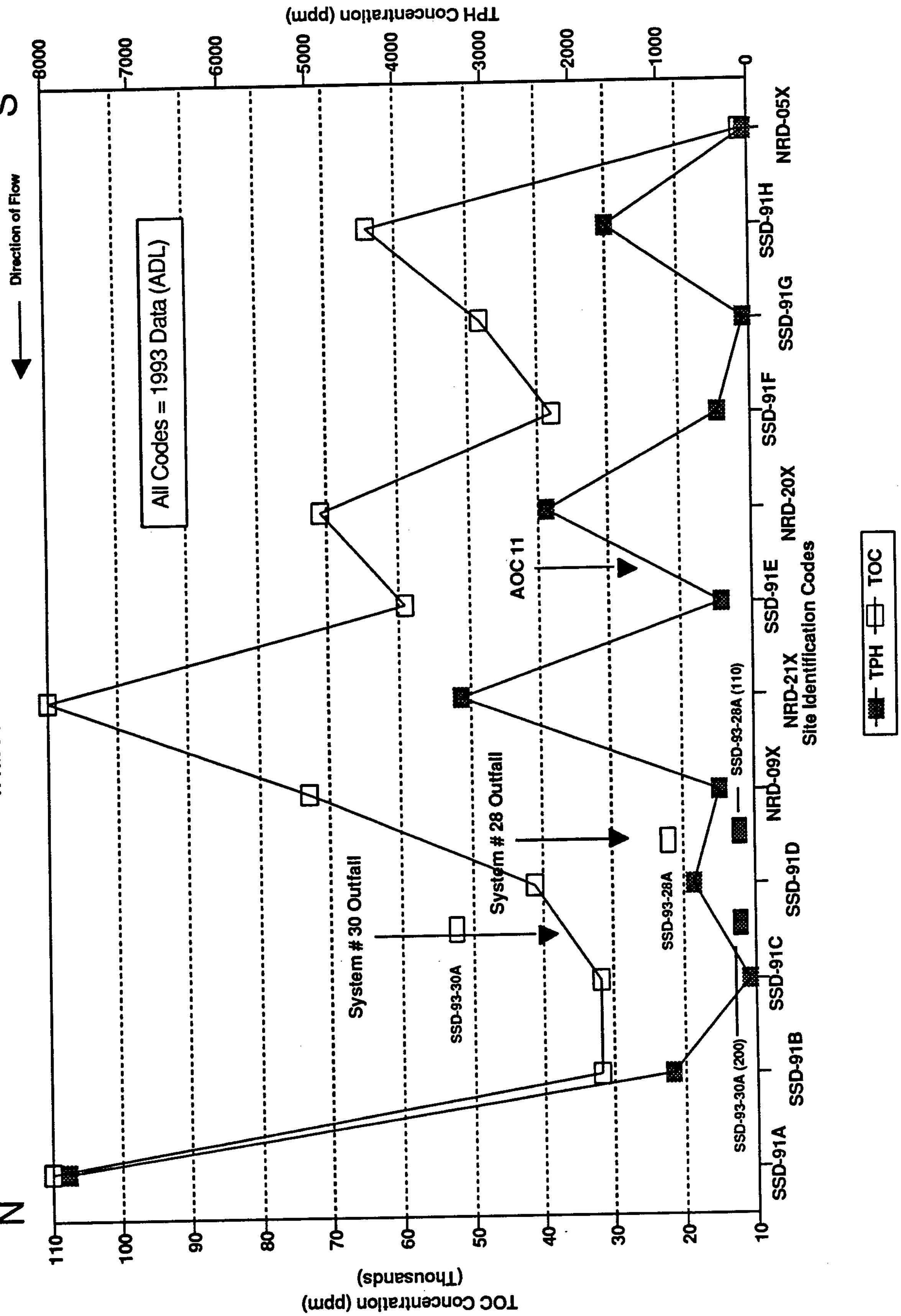


Figure 2-8

Nashua River, Central Section
Benzo[a]Anthracene, Benzo[a]pyrene, Phenanthrene in sediment

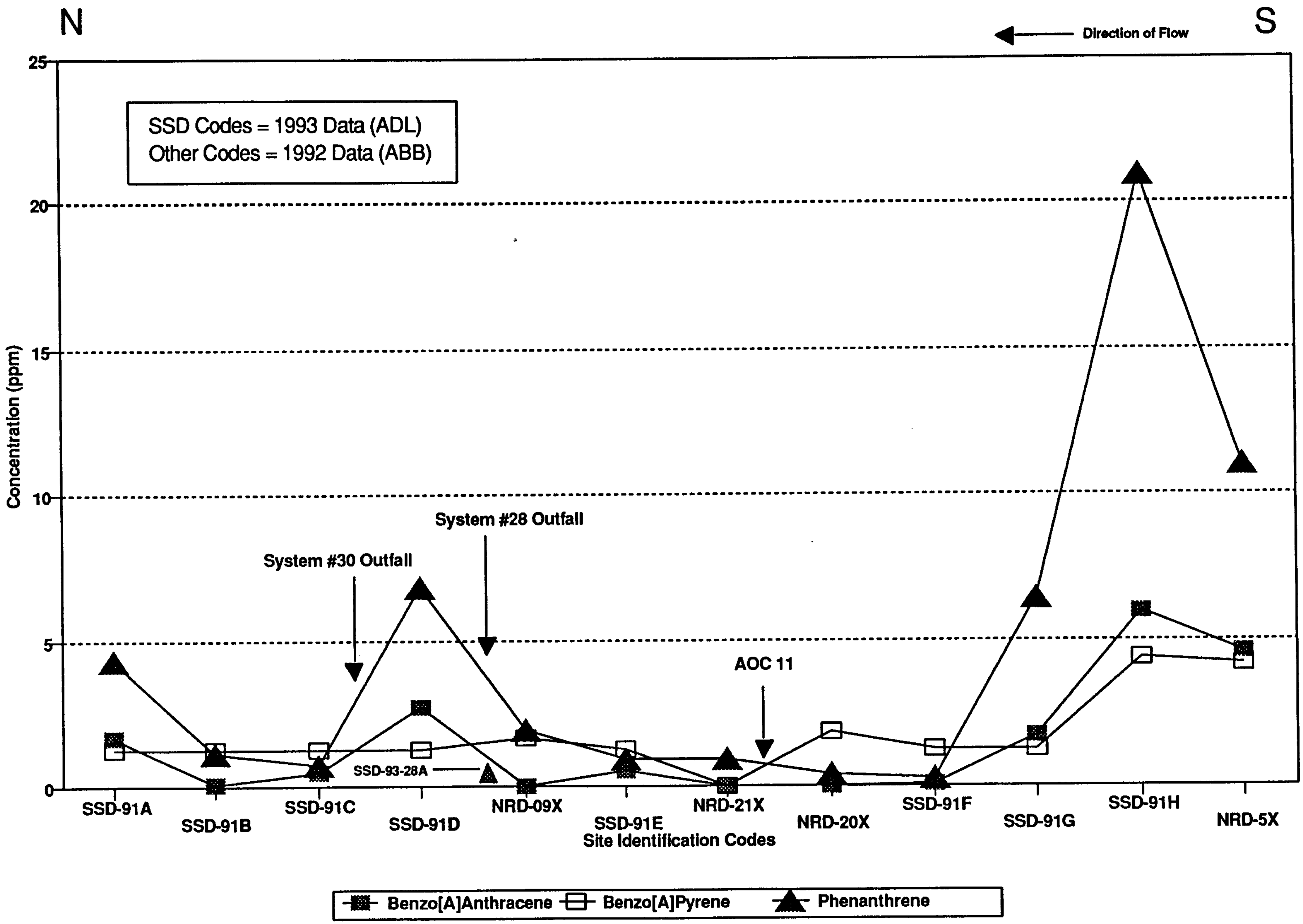
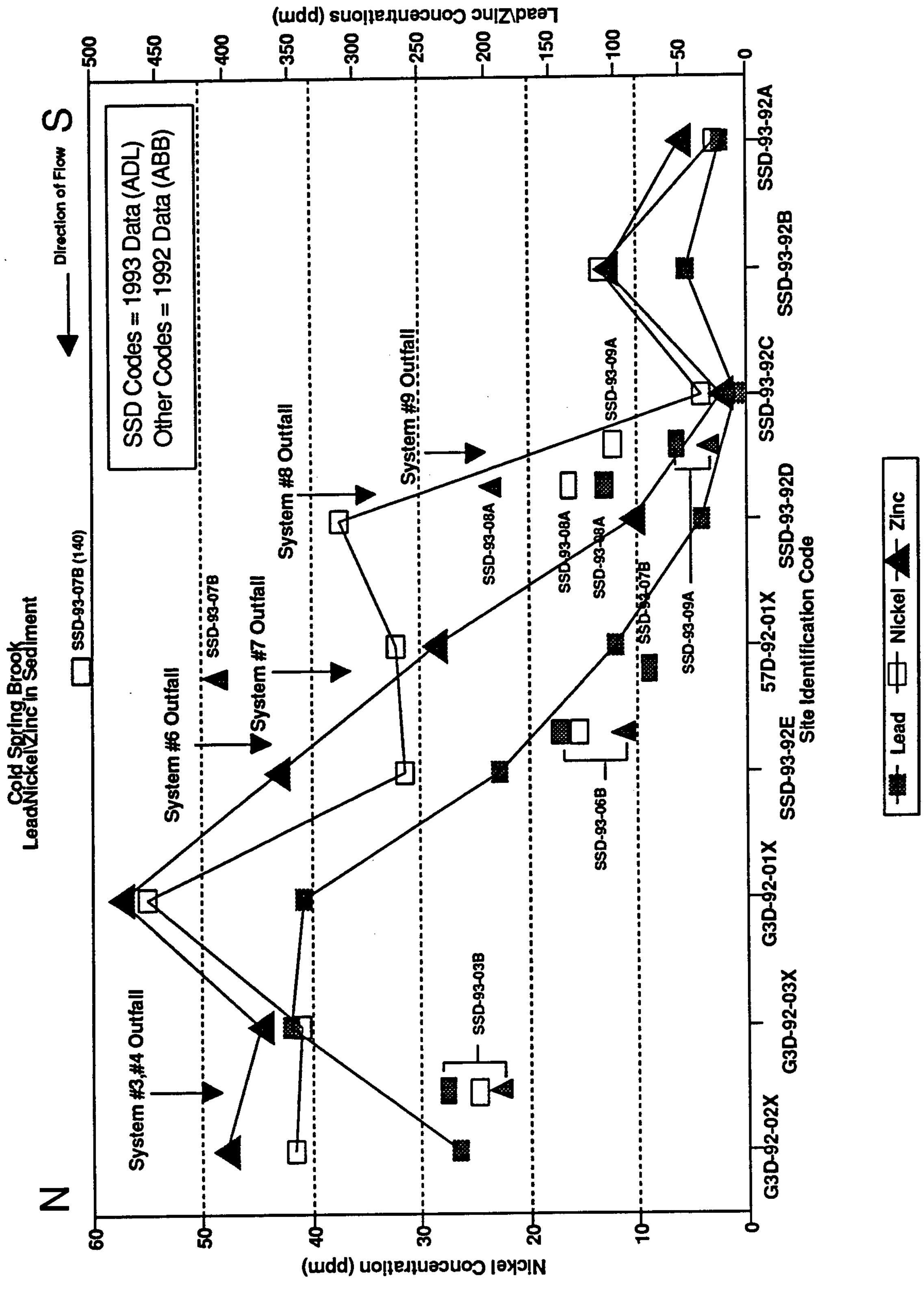


Figure 2-9



Cold Spring Brook
Lead\Nickel\Zinc in Sediment
N
S
Direction of Flow
SSD Codes = 1993 Data (ADL)
Other Codes = 1992 Data (ABB)
System #3,#4 Outfall
System #6 Outfall
System #7 Outfall
System #8 Outfall
System #9 Outfall
SSD-93-07B (140)
SSD-93-07B
SSD-93-03B
SSD-93-06B
SSD-93-08A
SSD-93-09A
SSD-93-07B
Nickel Concentration (ppm)
Lead\Zinc Concentrations (ppm)
0
10
20
30
40
50
60
50
100
150
200
250
300
350
400
450
500
G3D-92-02X
G3D-92-03X
G3D-92-01X
SSD-93-92E
57D-92-01X
SSD-93-92D
SSD-93-92C
SSD-93-92B
SSD-93-92A
Site Identification Code
Lead
Nickel
Zinc

Figure 2-10

Cold Spring Brook
Arsenic\Chromium in Sediment

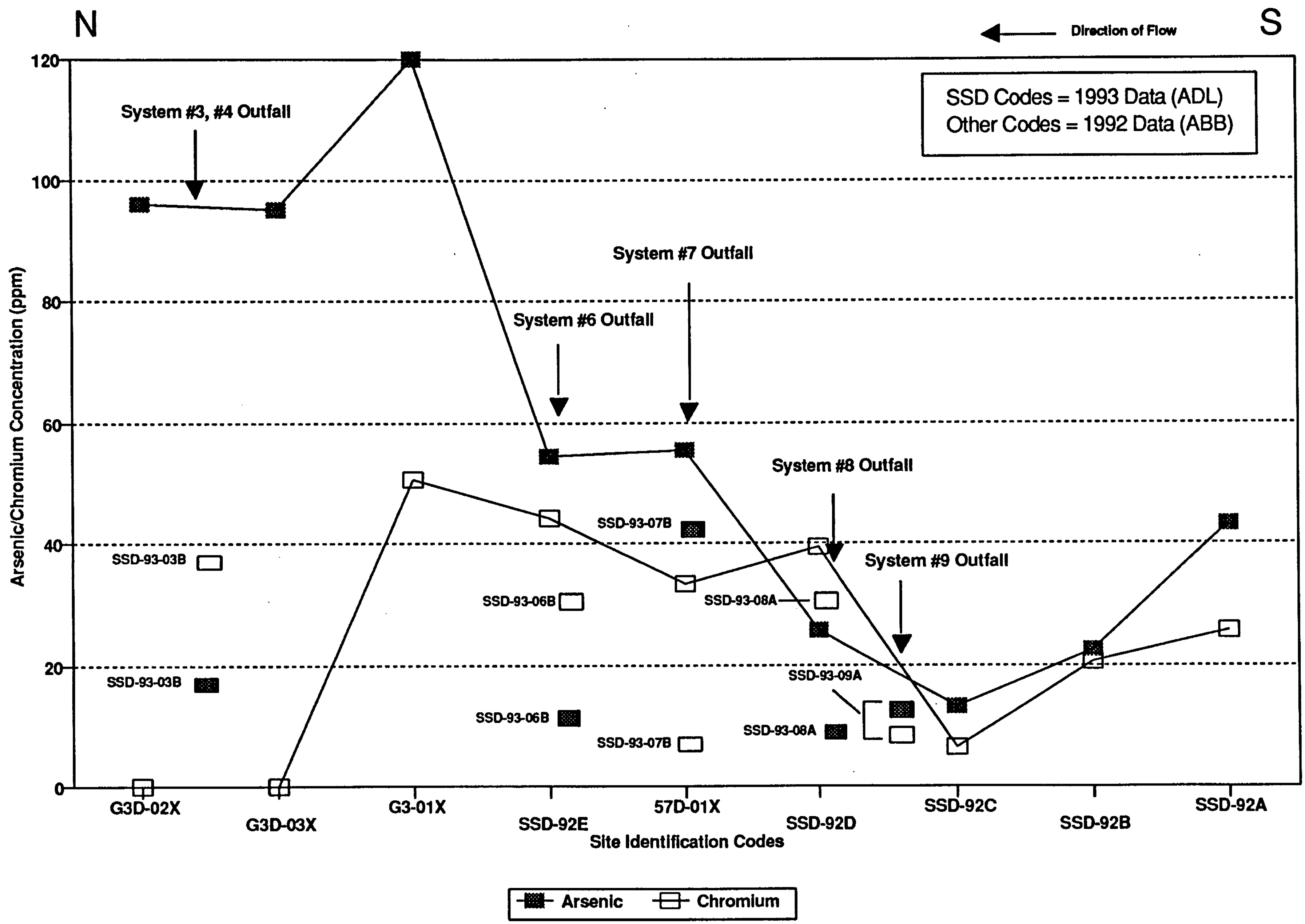
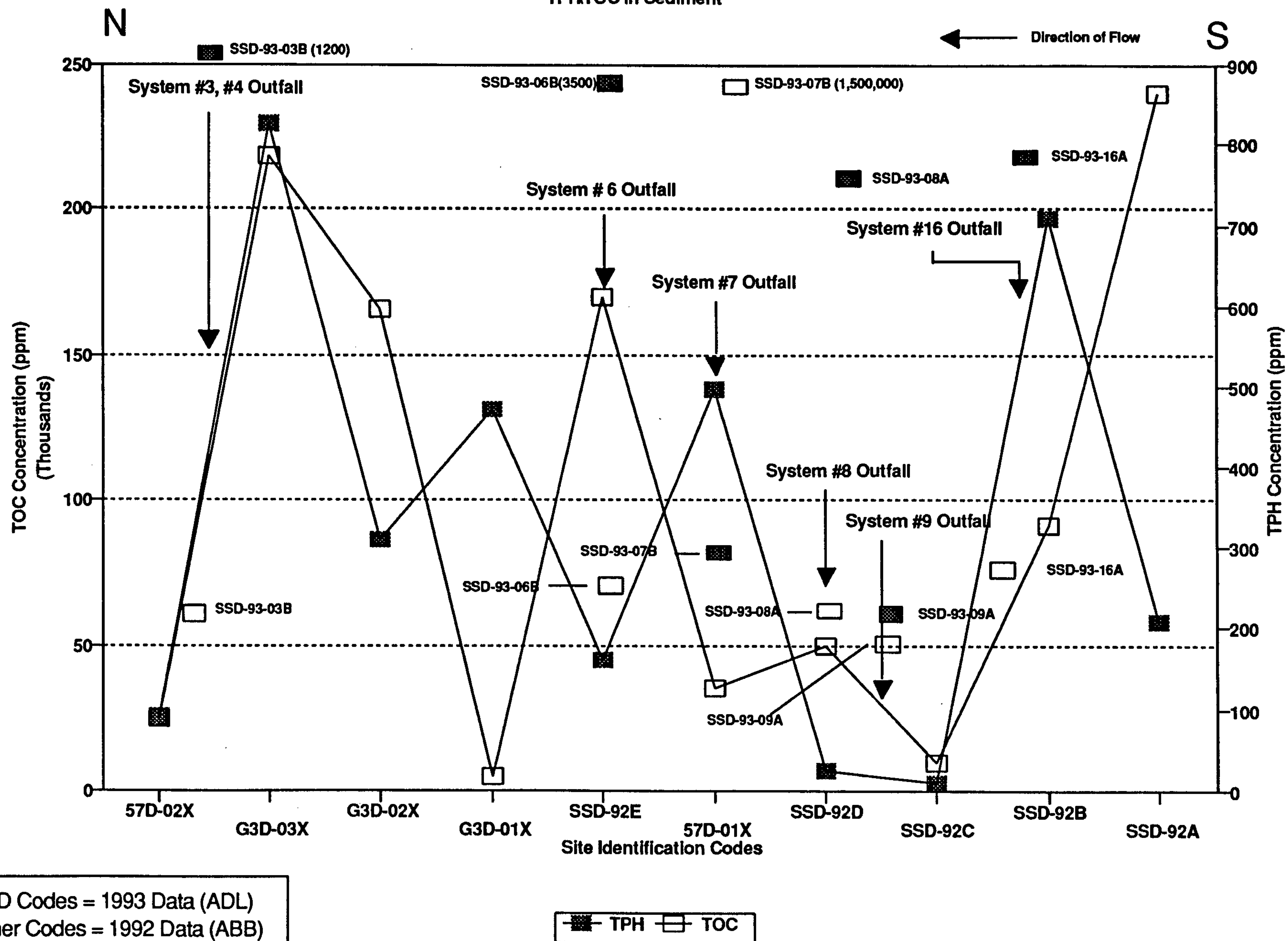


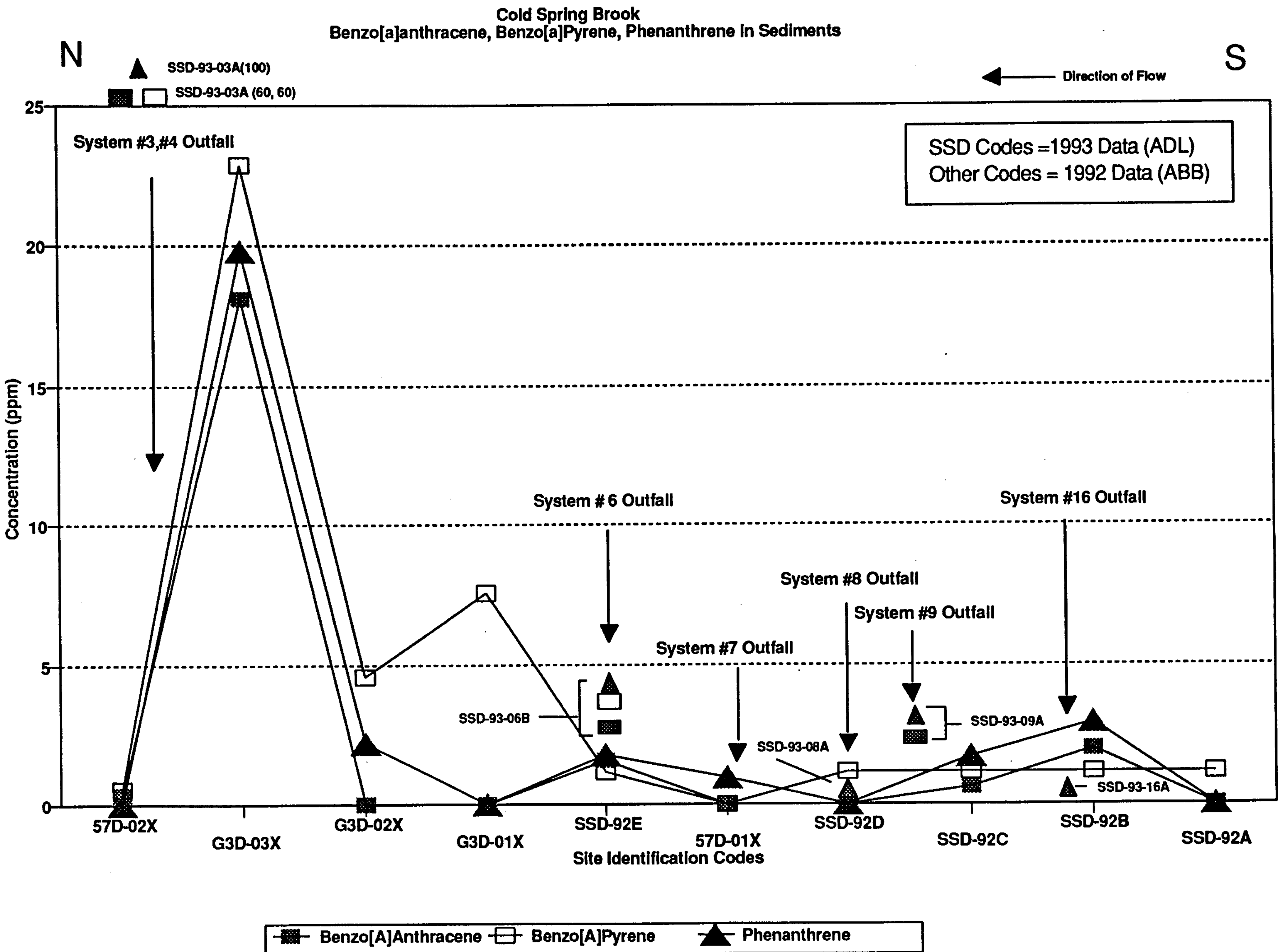
Figure 2-11

Cold Spring Brook
TPH/TOC in Sediment



SSD Codes = 1993 Data (ADL)
Other Codes = 1992 Data (ABB)

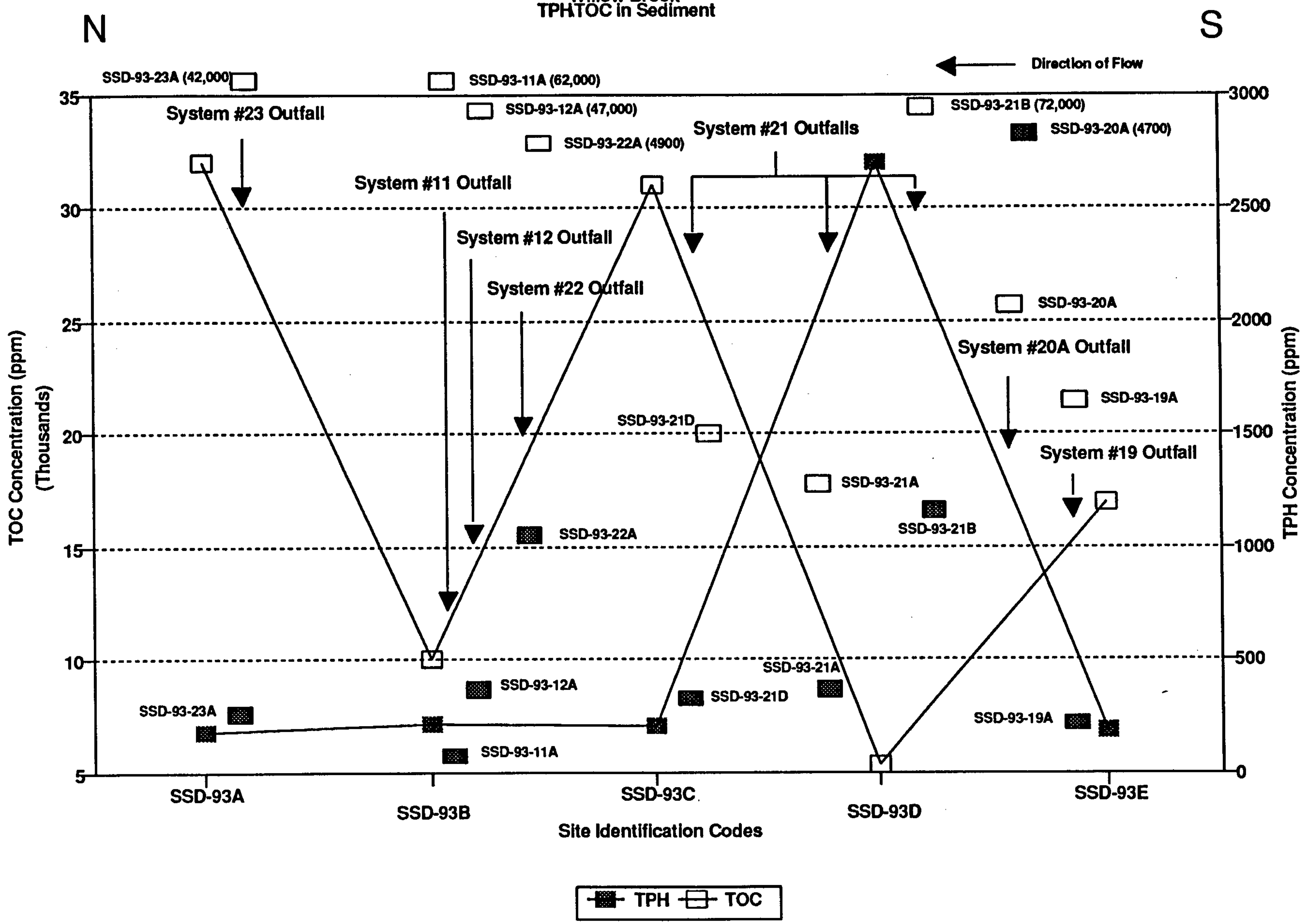
Figure 2-12



Cold Spring Brook
Benzo[a]anthracene, Benzo[a]Pyrene, Phenanthrene in Sediments
N
S
SSD-93-03A(100)
SSD-93-03A (60, 60)
Direction of Flow
SSD Codes =1993 Data (ADL)
Other Codes = 1992 Data (ABB)
System #3,#4 Outfall
System # 6 Outfall
System #7 Outfall
System #8 Outfall
System #9 Outfall
System #16 Outfall
SSD-93-06B
SSD-93-08A
SSD-93-09A
SSD-93-16A
Concentration (ppm)
25
20
15
10
5
0
57D-02X
G3D-03X
G3D-02X
G3D-01X
SSD-92E
57D-01X
SSD-92D
SSD-92C
SSD-92B
SSD-92A
Site Identification Codes
Benzo[A]Anthracene
Benzo[A]Pyrene
Phenanthrene

Figure 2-13

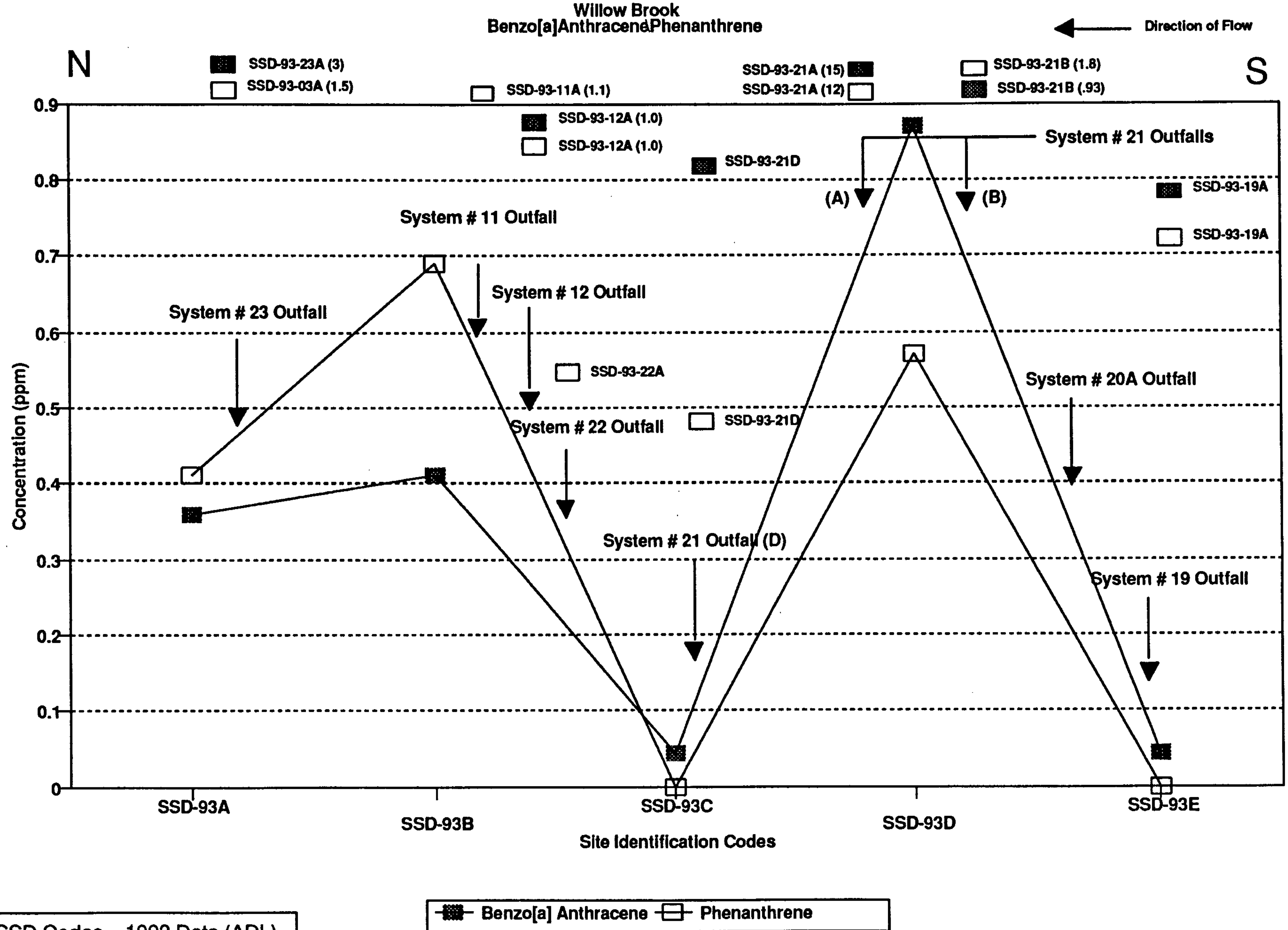
Willow Brook
TPH/TOC in Sediment



All Codes = 1993 Data (ADL)

Figure 2-14

Willow Brook
Benzo[a]Anthracene&Phenanthrene

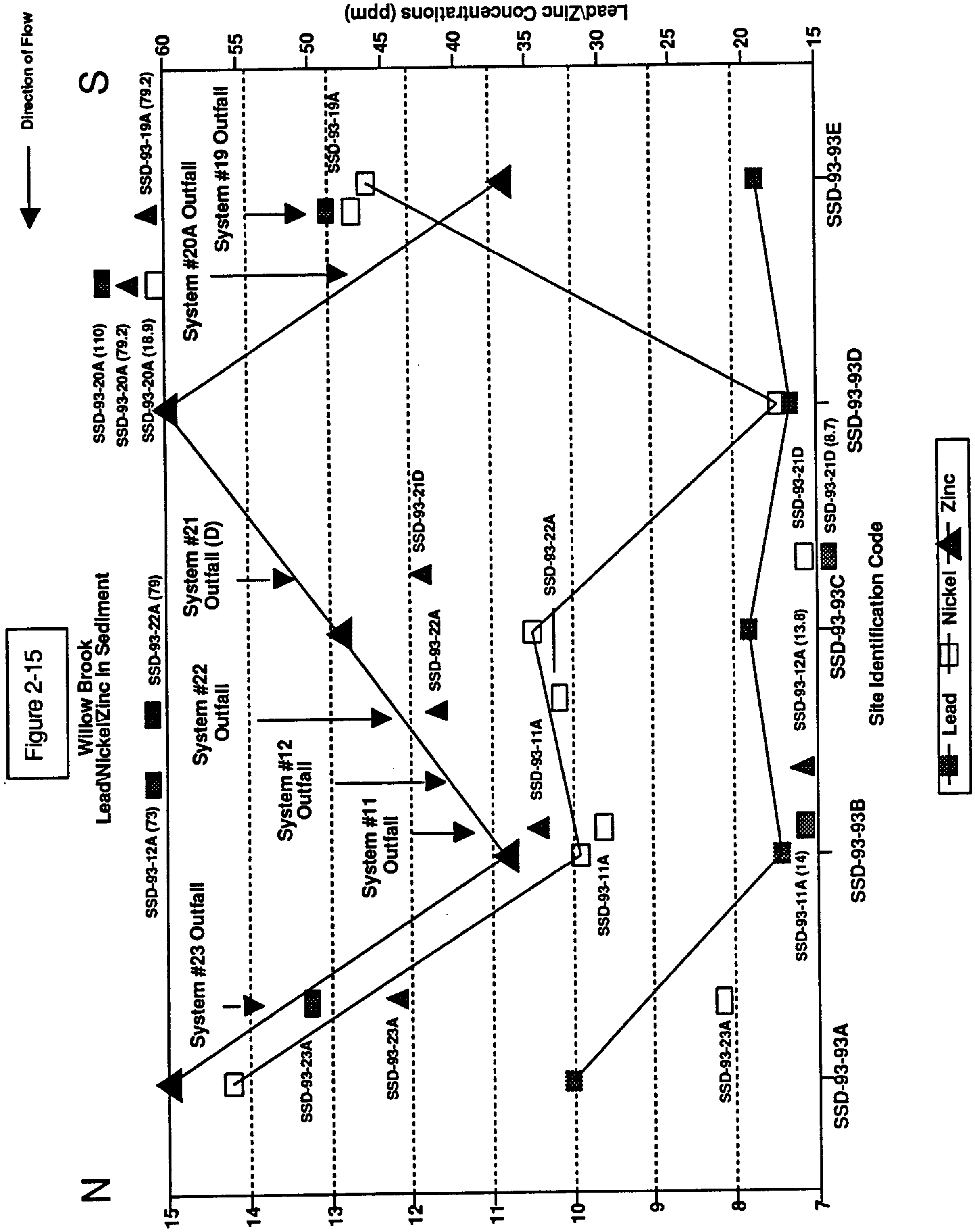


SSD Codes = 1993 Data (ADL)

* System # 21 has 3 Outfalls

Figure 2-15

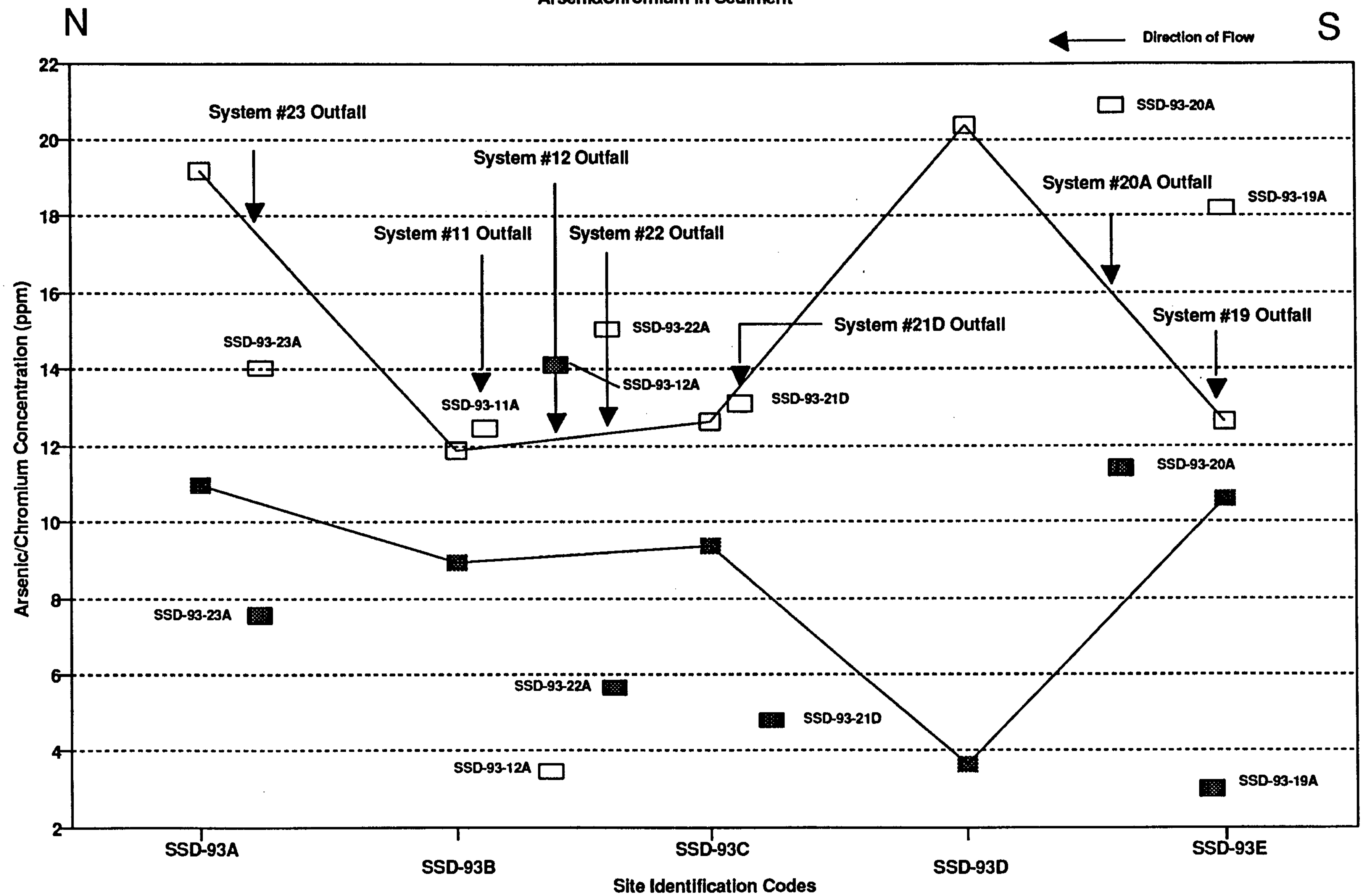
Willow Brook Lead\Nickel\Zinc in Sediment



SSD Codes = 1993 Data (ADL)

Figure 2-16

Willow Brook
Arsenic/Chromium in Sediment



SSD Codes = 1993 Data (ADL)

2.0 Sample Analysis Results

Explanation of Sample Labeling System for Tables 2-1 through 2-4

Codes for Site ID:

SSD = Sediment Sampling Location
SSW = Surface Water Sampling Location

93 = Year

90 - 93 = River/Brook System Number

A - Z = Replicate Number

Codes for Field Sample Number:

Position	Description
1	D - Sediment W - Water
2	X - Regular Sample D - Duplicate Field Sample R - Rinse Blank T - Trip Blank F - Field Blank M - Matrix Spike Z - Matrix Spike Duplicate
3-4	00 - 99 Storm Sewer System Number
5-6	00 - 99 Replicate Number
7-8	00 - 99 Sample Depth

Table 2-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-90A DD900100 UA02753 RVER 0 Duplicate 14-Sep-93	SSD-93-90A DX900100 UA02752 RVER 0 14-Sep-93	SSW-93-90A WX9001X1 UA02760 RVER 0 14-Sep-93	SSD-93-90B DX900200 UA02751 RVER 0 14-Sep-93	SSW-93-90B WX9002X1 UA02759 RVER 0 14-Sep-93
Total Organic Carbon (ug/g)	7200	12000	NA	20000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	300	510	–	190	–
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	5710	4780	–	5680	–
Arsenic	–	5.27	–	8.79	–
Barium	37	28.7	18.5	23.2	18.5
Cadmium	3.38	–	–	–	–
Calcium	1000	767	15900	1540	15800
Chromium	26.5	19	–	22.2	–
Cobalt	–	–	–	–	–
Copper	23.8	16.9	–	18.6	–
Iron	7610	6920	414	8880	458
Lead	34	120	–	46	–
Magnesium	1560	1420	2180	1720	2210
Manganese	114	109	144	206	156
Nickel	7.83	7.17	–	9.63	–
Potassium	638	442	3190	546	2380
Selenium	–	–	–	–	–
Sodium	72.6	–	28600	76.9	28500
Tin	–	–	–	–	–
Vanadium	9.32	8.03	–	9.61	–
Zinc	61.3	51.6	–	49.7	–
Volatile Organic Compounds (ug/g Soil, ug/L Water)					
Halogenated Organics					
Chloromethane	–	–	–	–	–
Bromomethane	–	–	–	–	–
Methylene Chloride	–	–	–	–	–
Trichloroethene	–	–	–	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phthalates					
Diethyl Phthalate	–	–	–	–	–
Bis (2-Ethyl hexyl) Phthalate	1.6	1.5	–	1.4	–
Polynuclear Aromatics					
2-Methylnaphthalene	–	0.093	–	–	–
Acenaphthylene	0.12	0.15	–	–	–
Acenaphthene	–	0.24	–	–	–
Fluorene	–	0.41	–	–	–
Phenanthrene	0.34	4.5	–	0.34	–
Fluoranthrene	0.27	2.2	–	0.27	–
Pyrene	0.71	3.8	–	0.6	–
Benzo (a) Anthracene	–	1.4	–	–	–
Chrysene	0.42	1.6	–	–	–
Benzo (b) Fluoranthene	–	2.3	–	–	–
Benzo (k) Fluoranthene	–	0.8	–	–	–
Pesticides/PCBs (ug/g Soil, ug/L Water)					
p,p'-DDD	0.02	0.022	0.014	0.017	0.015
p,p'-DDE	0.004	0.004	–	0.005	–
p,p'-DDT	0.008	0.011	–	0.008	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-90A	SSD-93-90A	SSW-93-90A	SSD-93-90B	SSW-93-90B
Field Sample ID	DD900100	DX900100	WX9001X1	DX900200	WX9002X1
Lab Sample ID	UA02753	UA02752	UA02760	UA02751	UA02759
Site Type	RVER	RVER	RVER	RVER	RVER
Sample Depth (ft)	0	0	0	0	0
QC Type	Duplicate				
Collection Date:	14-Sep-93	14-Sep-93	14-Sep-93	14-Sep-93	14-Sep-93
Water Quality Parameters					
pH	NA	NA	6.5	NA	7.2
Conductivity (ms/cm)	NA	NA	0.23	NA	0.23
Turbidity (NTU)	NA	NA	40	NA	20
Dissolved Oxygen (mg/L)	NA	NA	7.5	NA	7.9
Temperature (C)	NA	NA	21	NA	22
Salinity (ppt)	NA	NA	0	NA	0
Total Suspended Solids (ug/L)	NA	NA	–	NA	–
Hardness (ug/L)	NA	NA	48000	NA	48000
Alkalinity (ug/L)	NA	NA	23000	NA	28000
Nitrate/Nitrite (ug/L)	NA	NA	1700	NA	1700
Total Phosphorus (ug/L)	NA	NA	125	NA	130
Total Kjedahl Nitrogen (ug/L)	NA	NA	394	NA	416
Anions (ug/L)					
Chloride	NA	NA	36000	NA	36000
Sulfate	NA	NA	17000	NA	17000

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-90C	SSW-93-90C	SSD-93-90D	SSW-93-90D	SSD-93-90E
Field Sample ID	DX900300	WX9003X1	DX900400	WX9004X1	DX900500
Lab Sample ID	UA02748	UA02756	UA02750	UA02758	UA02749
Site Type	RVER	RVER	RVER	RVER	RVER
Sample Depth (ft)	0	0	0	0	0
QC Type					
Collection Date:	13-Sep-93	13-Sep-93	13-Sep-93	13-Sep-93	13-Sep-93
Total Organic Carbon (ug/g)	11000	NA	15000	NA	12000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	320	–	30	–	100
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	6520	–	5530	–	5020
Arsenic	4.16	–	5.3	–	–
Barium	61.6	17.3	23.9	17.3	15.5
Cadmium	8.06	–	–	–	–
Calcium	1250	14100	735	14300	1170
Chromium	51.1	–	15.7	–	29.4
Cobalt	–	–	3.17	–	–
Copper	53.2	–	7.9	–	12.5
Iron	6530	436	9080	467	7480
Lead	60	9.19	12	–	29
Magnesium	1370	2010	2610	2050	2460
Manganese	80.5	155	231	156	92.9
Nickel	8.2	–	9.52	–	6.61
Potassium	586	2600	1030	2680	524
Selenium	–	–	–	–	–
Sodium	93.3	24400	57.6	25100	–
Tin	16.5	–	–	–	–
Vanadium	11	–	11.1	–	9.01
Zinc	113	–	24	–	33.9
Volatile Organic Compounds (ug/g Soil, ug/L Water)					
Halogenated Organics					
Chloromethane	–	–	–	–	–
Bromomethane	–	–	–	–	–
Methylene Chloride	–	–	–	–	–
Trichloroethene	–	1.9	–	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phthalates					
Diethyl Phthalate	–	–	–	–	–
Bis (2-Ethyl hexyl) Phthalate	3	–	–	–	–
Polynuclear Aromatics					
2-Methylnaphthalene	–	–	–	–	–
Acenaphthylene	0.11	–	–	–	–
Acenaphthene	–	–	–	–	–
Fluorene	–	–	–	–	–
Phenanthrene	0.43	–	–	–	0.16
Fluoranthrene	0.35	–	–	–	0.13
Pyrene	0.82	–	–	–	0.28
Benzo (a) Anthracene	–	–	–	–	–
Chrysene	–	–	–	–	–
Benzo (b) Fluoranthene	–	–	–	–	–
Benzo (k) Fluoranthene	–	–	–	–	–
Pesticides/PCBs (ug/g Soil, ug/L Water)					
p,p'-DDD	–	0.016	–	0.018	0.006
p,p'-DDE	–	–	–	–	–
p,p'-DDT	–	–	–	–	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-90C DX900300 UA02748 RVER 0 13-Sep-93	SSW-93-90C WX9003X1 UA02756 RVER 0 13-Sep-93	SSD-93-90D DX900400 UA02750 RVER 0 13-Sep-93	SSW-93-90D WX9004X1 UA02758 RVER 0 13-Sep-93	SSD-93-90E DX900500 UA02749 RVER 0 13-Sep-93
Water Quality Parameters					
pH	NA	7.1	NA	6.4	NA
Conductivity (ms/cm)	NA	0.21	NA	0.21	NA
Turbidity (NTU)	NA	20	NA	10	NA
Dissolved Oxygen (mg/L)	NA	9.2	NA	8.9	NA
Temperature (C)	NA	21	NA	21	NA
Salinity (ppt)	NA	0	NA	0	NA
Total Suspended Solids (ug/L)	NA	–	NA	6000	NA
Hardness (ug/L)	NA	43000	NA	43000	NA
Alkalinity (ug/L)	NA	24000	NA	23000	NA
Nitrate/Nitrite (ug/L)	NA	1500	NA	1500	NA
Total Phosphorus (ug/L)	NA	183	NA	178	NA
Total Kjedahl Nitrogen (ug/L)	NA	308	NA	385	NA
Anions (ug/L)					
Chloride	NA	29000	NA	31000	NA
Sulfate	NA	13000	NA	13000	NA

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSW-93-90E WX9005X1 UA02757 RVER 0 13-Sep-93	SSD-93-90F DX900600 UA02746 RVER 0 13-Sep-93	SSW-93-90F WX9006X1 UA02754 RVER 0 13-Sep-93	SSD-93-90G DX900700 UA02747 RVER 0 13-Sep-93	SSW-93-90G WX9007X1 UA02755 RVER 0 13-Sep-93
Total Organic Carbon (ug/g)	NA	14000	NA	29000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	–	23	–	130	–
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	–	5300	–	9900	–
Arsenic	–	9.74	2.66	3.83	–
Barium	16.8	78.5	17.6	25	18.2
Cadmium	–	2.06	–	–	–
Calcium	13800	2950	13600	1160	13900
Chromium	–	10.1	–	47	–
Cobalt	–	7.78	–	4.56	–
Copper	–	12.1	–	13.9	–
Iron	435	12400	482	20000	534
Lead	–	20	–	34	–
Magnesium	1960	2280	1940	6500	1940
Manganese	155	2300	120	284	128
Nickel	–	13.7	–	15.8	–
Potassium	2380	447	2890	707	2460
Selenium	–	–	2.71	–	–
Sodium	24200	–	24200	55.1	24900
Tin	–	–	–	–	–
Vanadium	–	8.06	–	18.7	–
Zinc	–	80.4	–	66.5	–
Volatile Organic Compounds (ug/g Soil, ug/L Water)					
Halogenated Organics					
Chloromethane	–	–	–	1	–
Bromomethane	–	–	–	–	–
Methylene Chloride	–	–	–	–	–
Trichloroethene	–	–	–	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phthalates					
Diethyl Phthalate	–	2.9	–	–	–
Bis (2-Ethyl hexyl) Phthalate	–	–	–	–	–
Polynuclear Aromatics					
2-Methylnaphthalene	–	–	–	–	–
Acenaphthylene	–	–	–	–	–
Acenaphthene	–	–	–	–	–
Fluorene	–	–	–	–	–
Phenanthrene	–	–	–	0.19	–
Fluoranthrene	–	–	–	0.16	–
Pyrene	–	–	–	0.35	–
Benzo (a) Anthracene	–	0.15	–	–	–
Chrysene	–	–	–	–	–
Benzo (b) Fluoranthene	–	–	–	–	–
Benzo (k) Fluoranthene	–	–	–	–	–
Pesticides/PCBs (ug/g Soil, ug/L Water)					
p,p'-DDD	0.015	–	0.018	0.01	0.018
p,p'-DDE	–	–	–	–	–
p,p'-DDT	–	–	–	0.005	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSW-93-90E	SSD-93-90F	SSW-93-90F	SSD-93-90G	SSW-93-90G
Field Sample ID	WX9005X1	DX900600	WX9006X1	DX900700	WX9007X1
Lab Sample ID	UA02757	UA02746	UA02754	UA02747	UA02755
Site Type	RVER	RVER	RVER	RVER	RVER
Sample Depth (ft)	0	0	0	0	0
QC Type					
Collection Date:	13-Sep-93	13-Sep-93	13-Sep-93	13-Sep-93	13-Sep-93
Water Quality Parameters					
pH	6.4	NA	6.6	NA	6.2
Conductivity (ms/cm)	0.21	NA	0.21	NA	0.21
Turbidity (NTU)	10	NA	0	NA	0
Dissolved Oxygen (mg/L)	9.6	NA	11.5	NA	10.8
Temperature (C)	20	NA	18	NA	17
Salinity (ppt)	0	NA	0	NA	0
Total Suspended Solids (ug/L)	–	NA	–	NA	–
Hardness (ug/L)	42000	NA	41000	NA	42000
Alkalinity (ug/L)	24000	NA	21000	NA	23000
Nitrate/Nitrite (ug/L)	1500	NA	1500	NA	1600
Total Phosphorus (ug/L)	183	NA	224	NA	218
Total Kjedahl Nitrogen (ug/L)	420	NA	453	NA	412
Anions (ug/L)					
Chloride	35000	NA	31000	NA	30000
Sulfate	14000	NA	13000	NA	13000

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-90H	SSW-93-90H
Field Sample ID	DX900800	WX9008X1
Lab Sample ID	UA02707	UA02740
Site Type	RVER	RVER
Sample Depth (ft)	0	0
QC Type		
Collection Date:	10-Sep-93	10-Sep-93
Total Organic Carbon (ug/g)	19000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	420	–
Inorganic Compounds (ug/g Soil, ug/L Water)		
Aluminum	3930	–
Arsenic	–	–
Barium	27.8	25.3
Cadmium	–	–
Calcium	1290	17200
Chromium	13.7	–
Cobalt	–	–
Copper	16.6	–
Iron	5880	687
Lead	53	–
Magnesium	1120	2280
Manganese	63	94.9
Nickel	6.56	–
Potassium	402	4240
Selenium	–	–
Sodium	–	35800
Tin	–	–
Vanadium	5.52	–
Zinc	48.1	–
Volatile Organic Compounds (ug/g Soil, ug/L Water)		
Halogenated Organics		
Chloromethane	–	–
Bromomethane	0.42	–
Methylene Chloride	–	2.7
Trichloroethene	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)		
Phthalates		
Diethyl Phthalate	–	–
Bis (2-Ethyl hexyl) Phthalate	2.7	–
Polynuclear Aromatics		
2-Methylnaphthalene	–	–
Acenaphthylene	0.18	–
Acenaphthene	–	–
Fluorene	–	–
Phenanthrene	0.57	–
Fluoranthrene	0.4	–
Pyrene	1.3	–
Benzo (a) Anthracene	–	–
Chrysene	0.51	–
Benzo (b) Fluoranthene	–	–
Benzo (k) Fluoranthene	1.1	–
Pesticides/PCBs (ug/g Soil, ug/L Water)		
p,p'-DDD	0.01	0.013
p,p'-DDE	–	–
p,p'-DDT	–	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-1
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-90H	SSW-93-90H
Field Sample ID	DX900800	WX9008X1
Lab Sample ID	UA02707	UA02740
Site Type	RVER	RVER
Sample Depth (ft)	0	0
QC Type		
Collection Date:	10-Sep-93	10-Sep-93
Water Quality Parameters		
pH	NA	7
Conductivity (ms/cm)	NA	0.27
Turbidity (NTU)	NA	0
Dissolved Oxygen (mg/L)	NA	10.2
Temperature (C)	NA	21
Salinity (ppt)	NA	0
Total Suspended Solids (ug/L)	NA	4000
Hardness (ug/L)	NA	51000
Alkalinity (ug/L)	NA	23000
Nitrate/Nitrite (ug/L)	NA	2100
Total Phosphorus (ug/L)	NA	127
Total Kjedahl Nitrogen (ug/L)	NA	589
Anions (ug/L)		
Chloride	NA	52000
Sulfate	NA	24000

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-91A DX910100 UA02877 RVER 0 16-Sep-93	SSW-93-91A WX9101X1 UA02872 RVER 0 16-Sep-93	SSD-93-91B DX910200 UA02880 RVER 0 16-Sep-93	SSW-93-91B WX9102X1 UA02874 RVER 0 16-Sep-93	SSD-93-91C DX910300 UA02809 RVER 0 15-Sep-93
Total Organic Carbon (ug/g)	110000	NA	32000	NA	32000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	7800	–	950	–	47
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	15500	–	8400	–	4480
Arsenic	11.7	–	8.15	–	3.54
Barium	405	20.8	92.5	20.5	16.9
Cadmium	180	–	13.5	–	–
Calcium	2060	15700	2040	15200	812
Chromium	214	–	52.6	–	12.5
Copper	385	–	89	–	11.2
Iron	11000	530	10400	502	7500
Lead	520	–	120	–	18
Magnesium	1810	2070	2040	2010	1440
Manganese	152	108	472	103	74.6
Nickel	25.5	–	14.6	–	6.4
Potassium	1030	3680	846	3620	374
Selenium	9.7	–	1.1	–	–
Silver	11.8	–	–	–	–
Sodium	201	32000	135	30800	109
Tin	46.1	–	25.5	–	–
Vanadium	35.8	–	16.8	–	6.81
Zinc	988	–	208	–	43.8
Volatile Organic Compounds (ug/g Soil, ug/L Water)					
Water Solubles					
Acetone	–	–	–	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phenols					
Dibenzofuran	–	–	–	–	–
Phthalates					
Bis (2-Ethyl hexyl) Phthalate	16	–	6.1	–	–
Polynuclear Aromatics					
Naphthalene	–	–	–	–	–
2-Methylnaphthalene	1.2	–	–	–	–
Acenaphthylene	0.65	–	0.22	–	0.11
Acenaphthene	–	–	–	–	–
Fluorene	0.8	–	–	–	–
Phenanthrene	4.3	–	1.1	–	0.71
Anthracene	–	–	–	–	–
Fluoranthrene	2	–	0.65	–	0.7
Pyrene	5.8	–	3.1	–	0.92
Benzo (a) Anthracene	1.6	–	–	–	0.46
Chrysene	3.4	–	1.6	–	0.54
Benzo (b) Fluoranthene	–	–	–	–	–
Benzo (k) Fluoranthene	–	–	–	–	0.44
Benzo (a) Pyrene	–	–	–	–	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-91A	SSW-93-91A	SSD-93-91B	SSW-93-91B	SSD-93-91C
Field Sample ID	DX910100	WX9101X1	DX910200	WX9102X1	DX910300
Lab Sample ID	UA02877	UA02872	UA02880	UA02874	UA02809
Site Type	RVER	RVER	RVER	RVER	RVER
Sample Depth (ft)	0	0	0	0	0
QC Type					
Collection Date:	16-Sep-93	16-Sep-93	16-Sep-93	16-Sep-93	15-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)					
Endosulfan I	0.021	–	–	–	–
Aldrin	0.019	–	–	–	–
Dieldrin	0.031	–	0.013	–	0.005
Isodrin	0.022	–	–	–	–
Lindane	–	–	–	–	–
p,p'-DDD	0.1 GT	0.013	0.026	0.012	0.006
p,p'-DDE	0.136	–	0.006	–	–
p,p'-DDT	0.084	–	–	–	–
Water Quality Parameters					
pH	NA	7.9	NA	8.1	NA
Conductivity (ms/cm)	NA	0.27	NA	0.27	NA
Turbidity (NTU)	NA	0	NA	0	NA
Dissolved Oxygen (mg/L)	NA	8.4	NA	8.2	NA
Temperature (C)	NA	19	NA	19	NA
Salinity (ppt)	NA	0	NA	0	NA
Total Suspended Solids (ug/L)	NA	–	NA	–	NA
Hardness (ug/L)	NA	47000	NA	45000	NA
Alkalinity (ug/L)	NA	25000	NA	26000	NA
Nitrate/Nitrite (ug/L)	NA	2300	NA	2300	NA
Total Phosphorus (ug/L)	NA	141	NA	134	NA
Total Kjedahl Nitrogen (ug/L)	NA	452	NA	426	NA
Anions (ug/L)					
Chloride	NA	38000	NA	40000	NA
Sulfate	NA	21000	NA	21000	NA

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSW-93-91C WX9103X1 UA02815 RVER 0 15-Sep-93	SSD-93-91D DX910400 UA02808 RVER 0 15-Sep-93	SSW-93-91D WX9104X1 UA02814 RVER 0 15-Sep-93	SSD-93-91E DX910500 UA02805 RVER 0 15-Sep-93	SSW-93-91E WX9105X1 UA02811 RVER 0 15-Sep-93
Total Organic Carbon (ug/g)	NA	41000	NA	59000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	–	690	–	330	–
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	–	7340	–	6300	–
Arsenic	–	6.73	–	6.12	–
Barium	20.8	56.2	21.1	56	22
Cadmium	–	7.15	–	5.72	–
Calcium	15800	1670	15500	1090	16000
Chromium	–	38.4	–	33.7	–
Copper	–	52.8	–	50.9	–
Iron	562	11000	548	11600	604
Lead	–	73	–	74	–
Magnesium	2050	1880	1990	1860	2010
Manganese	112	133	113	153	117
Nickel	–	10.9	–	9.04	–
Potassium	3680	659	3470	678	3250
Selenium	–	–	–	–	–
Silver	–	–	–	–	–
Sodium	31700	119	31000	–	32100
Tin	–	–	–	–	–
Vanadium	–	12.2	–	10.7	–
Zinc	–	130	–	97.3	–
Volatile Organic Compounds (ug/g Soil, ug/L Water)					
Water Solubles					
Acetone	–	–	–	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phenols					
Dibenzofuran	–	–	–	–	–
Phthalates					
Bis (2-Ethyl hexyl) Phthalate	–	4.5	–	2.8	–
Polynuclear Aromatics					
Naphthalene	–	–	–	–	–
2-Methylnaphthalene	–	0.19	–	0.17	–
Acenaphthylene	–	0.74	–	0.23	–
Acenaphthene	–	0.33	–	–	–
Fluorene	–	0.77	–	–	–
Phenanthrene	–	6.8	–	0.94	–
Anthracene	–	–	–	–	–
Fluoranthrene	–	4	–	0.6	–
Pyrene	–	6.9	–	1.2	–
Benzo (a) Anthracene	–	2.7	–	0.5	–
Chrysene	–	3.7	–	–	–
Benzo (b) Fluoranthene	–	2.7	–	–	–
Benzo (k) Fluoranthene	–	2.8	–	0.47	–
Benzo (a) Pyrene	–	–	–	–	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSW-93-91C	SSD-93-91D	SSW-93-91D	SSD-93-91E	SSW-93-91E
Field Sample ID	WX9103X1	DX910400	WX9104X1	DX910500	WX9105X1
Lab Sample ID	UA02815	UA02808	UA02814	UA02805	UA02811
Site Type	RVER	RVER	RVER	RVER	RVER
Sample Depth (ft)	0	0	0	0	0
QC Type					
Collection Date:	15-Sep-93	15-Sep-93	15-Sep-93	15-Sep-93	15-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)					
Endosulfan I	–	–	–	–	–
Aldrin	–	–	–	–	–
Dieldrin	–	0.016	–	0.003	–
Isodrin	–	–	–	–	–
Lindane	–	–	–	–	0.011
p,p'-DDD	0.013	0.023	–	0.006	0.013
p,p'-DDE	–	0.005	–	–	–
p,p'-DDT	–	0.01	–	–	–
Water Quality Parameters					
pH	8.1	NA	7.6	NA	7.6
Conductivity (ms/cm)	0.26	NA	0.26	NA	0.26
Turbidity (NTU)	3	NA	2	NA	0
Dissolved Oxygen (mg/L)	8	NA	8	NA	7.4
Temperature (C)	22	NA	22	NA	21
Salinity (ppt)	0	NA	0	NA	0
Total Suspended Solids (ug/L)	–	NA	–	NA	–
Hardness (ug/L)	47000	NA	46000	NA	47000
Alkalinity (ug/L)	26000	NA	27000	NA	27000
Nitrate/Nitrite (ug/L)	2200	NA	2100	NA	2400
Total Phosphorus (ug/L)	135	NA	132	NA	145
Total Kjedahl Nitrogen (ug/L)	445	NA	434	NA	405
Anions (ug/L)					
Chloride	46000	NA	44000	NA	40000
Sulfate	26000	NA	23000	NA	22000

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-91F	SSW-93-91F	SSD-93-91G	SSW-93-91G	SSD-93-91H
Field Sample ID	DX910600	WX9106X1	DX910700	WX9107X1	DX910800
Lab Sample ID	UA02804	UA02810	UA02806	UA02812	UA02807
Site Type	RVER	RVER	RVER	RVER	RVER
Sample Depth (ft)	0	0	0	0	0
QC Type					
Collection Date:	15-Sep-93	15-Sep-93	15-Sep-93	15-Sep-93	15-Sep-93
Total Organic Carbon (ug/g)	38000	NA	48000	NA	64000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	350	110	52	–	1600
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	6110	–	3630	–	4920
Arsenic	5.9	–	4.29	–	4.95
Barium	51.8	22.8	18	20.8	47.2
Cadmium	5.65	–	–	–	2.04
Calcium	1390	16600	542	15200	811
Chromium	31.5	–	11.4	–	36.9
Copper	45.5	–	20.3	–	40.6
Iron	8990	602	6550	602	6720
Lead	75	–	19	–	64
Magnesium	1340	2090	1120	1930	1130
Manganese	218	122	90.2	122	99
Nickel	7.93	–	6.66	–	7.35
Potassium	614	3830	425	3250	466
Selenium	–	–	–	–	–
Silver	–	–	–	–	–
Sodium	109	33300	–	31400	75.3
Tin	–	–	–	–	–
Vanadium	9.9	–	5.65	–	8.8
Zinc	104	–	34.2	–	71.1
Volatile Organic Compounds (ug/g Soil, ug/L Water)					
Water Solubles					
Acetone	–	–	–	54	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phenols					
Dibenzofuran	–	–	–	–	1.5
Phthalates					
Bis (2-Ethyl hexyl) Phthalate	–	–	1.2	–	1.5
Polynuclear Aromatics					
Naphthalene	–	–	–	–	2.3
2-Methylnaphthalene	–	–	0.34	–	0.91
Acenaphthylene	–	–	0.28	–	0.7
Acenaphthene	–	–	0.47	–	1.6
Fluorene	–	–	0.48	–	2.3
Phenanthrene	0.32	–	6.4	–	21
Anthracene	–	–	–	–	3.8
Fluoranthrene	0.24	–	2.8	–	8.4
Pyrene	0.39	–	4.3	–	13
Benzo (a) Anthracene	–	–	1.7	–	6
Chrysene	–	–	2	–	6.7
Benzo (b) Fluoranthene	–	–	1.2	–	5.4
Benzo (k) Fluoranthene	–	–	1.4	–	4.2
Benzo (a) Pyrene	–	–	–	–	4.4

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-91F DX910600 UA02804 RVER 0 15-Sep-93	SSW-93-91F WX9106X1 UA02810 RVER 0 15-Sep-93	SSD-93-91G DX910700 UA02806 RVER 0 15-Sep-93	SSW-93-91G WX9107X1 UA02812 RVER 0 15-Sep-93	SSD-93-91H DX910800 UA02807 RVER 0 15-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)					
Endosulfan I	–	–	–	–	–
Aldrin	–	–	–	–	–
Dieldrin	0.006	–	0.011	–	0.011
Isodrin	–	–	–	–	–
Lindane	–	–	–	–	–
p,p'-DDD	–	0.015	0.007	0.014	0.007
p,p'-DDE	–	–	0.004	–	0.004
p,p'-DDT	–	–	–	–	–
Water Quality Parameters					
pH	NA	7.5	NA	7.7	NA
Conductivity (ms/cm)	NA	0.26	NA	0.2	NA
Turbidity (NTU)	NA	0	NA	0	NA
Dissolved Oxygen (mg/L)	NA	7.2	NA	7.5	NA
Temperature (C)	NA	20	NA	21	NA
Salinity (ppt)	NA	0	NA	0	NA
Total Suspended Solids (ug/L)	NA	–	NA	–	NA
Hardness (ug/L)	NA	49000	NA	45000	NA
Alkalinity (ug/L)	NA	33000	NA	27000	NA
Nitrate/Nitrite (ug/L)	NA	2300	NA	2400	NA
Total Phosphorus (ug/L)	NA	132	NA	153	NA
Total Kjedahl Nitrogen (ug/L)	NA	423	NA	400	NA
Anions (ug/L)					
Chloride	NA	45000	NA	38000	NA
Sulfate	NA	25000	NA	21000	NA

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSW-93-91H WX9108X1 UA02813 RVER 0 15-Sep-93
Total Organic Carbon (ug/g)	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	–
Inorganic Compounds (ug/g Soil, ug/L Water)	
Aluminum	–
Arsenic	–
Barium	21.4
Cadmium	–
Calcium	15300
Chromium	–
Copper	–
Iron	583
Lead	–
Magnesium	2000
Manganese	121
Nickel	–
Potassium	3760
Selenium	–
Silver	–
Sodium	31800
Tin	–
Vanadium	–
Zinc	–
Volatile Organic Compounds (ug/g Soil, ug/L Water)	
Water Solubles	
Acetone	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)	
Phenols	
Dibenzofuran	–
Phthalates	
Bis (2-Ethyl hexyl) Phthalate	–
Polynuclear Aromatics	
Naphthalene	–
2-Methylnaphthalene	–
Acenaphthylene	–
Acenaphthene	–
Fluorene	–
Phenanthrene	–
Anthracene	–
Fluoranthrene	–
Pyrene	–
Benzo (a) Anthracene	–
Chrysene	–
Benzo (b) Fluoranthene	–
Benzo (k) Fluoranthene	–
Benzo (a) Pyrene	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-2
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSW-93-91H
Field Sample ID	WX9108X1
Lab Sample ID	UA02813
Site Type	RVER
Sample Depth (ft)	0
QC Type	
Collection Date:	15-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)	
Endosulfan I	–
Aldrin	–
Dieldrin	–
Isodrin	–
Lindane	–
p,p'-DDD	0.015
p,p'-DDE	–
p,p'-DDT	–
Water Quality Parameters	
pH	8.1
Conductivity (ms/cm)	0.2
Turbidity (NTU)	0
Dissolved Oxygen (mg/L)	7.5
Temperature (C)	21
Salinity (ppt)	0
Total Suspended Solids (ug/L)	–
Hardness (ug/L)	45000
Alkalinity (ug/L)	24000
Nitrate/Nitrite (ug/L)	2500
Total Phosphorus (ug/L)	138
Total Kjedahl Nitrogen (ug/L)	443
Anions (ug/L)	
Chloride	38000
Sulfate	20000

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-92A DX920100 UA02647 STRM 0 07-Sep-93	SSW-93-92A WD9201X1 UA02651 STRM 0 Duplicate 07-Sep-93	SSW-93-92A WX9201X1 UA02652 STRM 0 07-Sep-93	SSD-93-92B DX920200 UA02646 STRM 0 07-Sep-93	SSW-93-92B WX9202X1 UA02650 STRM 0 07-Sep-93
Total Organic Carbon (ug/g)	240000	NA	NA	91000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	210	–	–	710	–
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	6260	–	–	6440	–
Arsenic	43.5	11.4	11	22.6	6.02
Barium	55.8	18.3	16.8	24	15.1
Beryllium	–	–	–	–	–
Cadmium	–	–	–	–	–
Calcium	20700	40900	41000	4360	30700
Chromium	25.7	–	–	20.7	–
Cobalt	–	–	–	–	–
Copper	–	–	–	12.8	–
Iron	16200	2420	2550	14800	1570
Lead	18.1	–	–	45	–
Magnesium	1070	4720	4780	2750	3620
Manganese	1190	903	581	251	215
Nickel	–	–	–	13.2	–
Potassium	–	3480	3150	504	2600
Selenium	6.69	–	–	–	–
Silver	–	–	–	–	–
Sodium	264	17700	18000	117	17900
Vanadium	11.9	–	–	13.7	–
Zinc	50.5	–	–	107	–
Volatile Organic Compounds (ug/g Soil, ug/L Water) Halogenated Organics					
Methylene Chloride	–	–	–	–	–
Chloroform	–	3.5	1.1	–	–
1,1,1-Trichloroethane	–	–	–	–	–
Trichloroethene	–	–	–	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water) Phthalates					
Diethyl Phthalate	–	–	NA	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water) Polynuclear Aromatics					
Acenaphthylene	–	–	NA	1	–
Fluorene	–	–	NA	–	–
Phenanthrene	–	–	NA	2.9	–
Fluoranthrene	–	–	NA	2.4	–
Pyrene	–	–	NA	4.1	–
Benzo (a) Anthracene	–	–	NA	2	–
Chrysene	–	–	NA	2.2	–
Benzo (b) Fluoranthene	–	–	NA	1.7	–
Benzo (k) Fluoranthene	–	–	NA	1.3	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-92A	SSW-93-92A	SSW-93-92A	SSD-93-92B	SSW-93-92B
Field Sample ID	DX920100	WD9201X1	WX9201X1	DX920200	WX9202X1
Lab Sample ID	UA02647	UA02651	UA02652	UA02646	UA02650
Site Type	STRM	STRM	STRM	STRM	STRM
Sample Depth (ft)	0	0	0	0	0
QC Type		Duplicate			
Collection Date:	07-Sep-93	07-Sep-93	07-Sep-93	07-Sep-93	07-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)					
alpha-BHC	–	–	–	–	–
Dieldrin	–	–	–	0.021	–
Endosulfan Sulfate	0.002	–	–	0.072	–
p,p'-DDD	0.042	–	–	0.173	–
p,p'-DDE	0.014	–	–	0.041	–
p,p'-DDT	–	–	–	0.021	–
Water Quality Parameters					
pH	NA	NA	7.5	NA	7.7
Conductivity (ms/cm)	NA	NA	0.3	NA	0.25
Turbidity (NTU)	NA	NA	off scale	NA	off scale
Dissolved Oxygen (mg/L)	NA	NA	9.2	NA	9.1
Temperature (C)	NA	NA	21	NA	22
Salinity (ppt)	NA	NA	NA	NA	0
Total Suspended Solids (ug/L)	NA	7000	11000	NA	9000
Hardness (ug/L)	NA	120000	120000	NA	90000
Alkalinity (ug/L)	NA	110000	110000	NA	81000
Nitrate/Nitrite (ug/L)	NA	–	–	NA	–
Total Phosphorus (ug/L)	NA	20	14.6	NA	–
Total Kjedahl Nitrogen (ug/L)	NA	549	543	NA	441
Anions (ug/L)					
Chloride	NA	21000	2100	NA	30000
Sulfate	NA	745	702	NA	3530

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-92C DX920300 UA02648 STRM 0 07-Sep-93	SSW-93-92C WX9203X1 UA02653 STRM 0 07-Sep-93	SSD-93-92D DX920400 UA02649 STRM 0 07-Sep-93	SSW-93-92D WX9204X1 UA02654 STRM 0 07-Sep-93	SSD-93-92E DX920500 UA02656 STRM 0 08-Sep-93
Total Organic Carbon (ug/g)	9600	NA	50000	NA	170000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	–	–	23	–	160
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	3080	–	15400	–	18000
Arsenic	13.1	–	25.8	4.58	54.7
Barium	7.85	7.28	72.8	13.6	125
Beryllium	–	–	–	–	–
Cadmium	–	–	–	–	–
Calcium	482	15100	3140	27800	12500
Chromium	6.24	–	39.4	–	44.3
Cobalt	–	–	11.7	–	22.4
Copper	–	–	4.76	–	30.1
Iron	6440	138	37200	615	35000
Lead	6.31	–	34	–	190
Magnesium	1370	2520	11000	4030	4520
Manganese	214	53.6	1500	109	2440
Nickel	3.94	–	37.4	–	31.3
Potassium	–	–	3830	1540	1160
Selenium	–	–	–	–	–
Silver	–	–	–	–	–
Sodium	–	24300	91	19000	349
Vanadium	4.09	–	26.9	–	37
Zinc	18.1	–	85.2	–	359
Volatile Organic Compounds (ug/g Soil, ug/L Water) Halogenated Organics					
Methylene Chloride	–	–	–	–	–
Chloroform	–	–	–	–	–
1,1,1-Trichloroethane	–	–	0.28	–	–
Trichloroethene	–	–	–	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water) Phthalates					
Diethyl Phthalate	–	–	–	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water) Polynuclear Aromatics					
Acenaphthylene	0.15	–	–	–	–
Fluorene	0.17	–	–	–	–
Phenanthrene	1.7	–	–	–	1.8
Fluoranthrene	0.95	–	–	–	1.8
Pyrene	1.4	–	–	–	2.7
Benzo (a) Anthracene	0.64	–	–	–	1.6
Chrysene	0.68	–	–	–	–
Benzo (b) Fluoranthene	–	–	–	–	–
Benzo (k) Fluoranthene	0.51	–	–	–	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-92C DX920300 UA02648 STRM 0 07-Sep-93	SSW-93-92C WX9203X1 UA02653 STRM 0 07-Sep-93	SSD-93-92D DX920400 UA02649 STRM 0 07-Sep-93	SSW-93-92D WX9204X1 UA02654 STRM 0 07-Sep-93	SSD-93-92E DX920500 UA02656 STRM 0 08-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)					
alpha-BHC	–	–	–	–	–
Dieldrin	0.008	–	–	–	–
Endosulfan Sulfate	0.001	–	0.003	–	0.011
p,p'-DDD	–	–	0.011	–	0.06
p,p'-DDE	–	–	0.004	–	0.028
p,p'-DDT	–	–	–	–	–
Water Quality Parameters					
pH	NA	8.1	NA	7.6	NA
Conductivity (ms/cm)	NA	0.18	NA	0.22	NA
Turbidity (NTU)	NA	70	NA	off scale	NA
Dissolved Oxygen (mg/L)	NA	8.7	NA	8.9	NA
Temperature (C)	NA	17	NA	21	NA
Salinity (ppt)	NA	0	NA	0	NA
Total Suspended Solids (ug/L)	NA	4000	NA	4000	NA
Hardness (ug/L)	NA	47000	NA	84000	NA
Alkalinity (ug/L)	NA	20000	NA	48000	NA
Nitrate/Nitrite (ug/L)	NA	170	NA	162	NA
Total Phosphorus (ug/L)	NA	–	NA	14.6	NA
Total Kjedahl Nitrogen (ug/L)	NA	70.8	NA	229	NA
Anions (ug/L)					
Chloride	NA	37000	NA	30000	NA
Sulfate	NA	8390	NA	10000	NA

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSW-93-92E WX9205X1 UA02665 STRM 0 08-Sep-93	SSW-93-92F WX9206X1 UA02679 STRM 0 09-Sep-93	SSD-93-92G DX920700 UA02881 STRM 0 16-Sep-93	SSW-93-92G WX9207X1 UA02875 STRM 0 16-Sep-93
Total Organic Carbon (ug/g)	NA	NA	170000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	–	–	1800	1300
Inorganic Compounds (ug/g Soil, ug/L Water)				
Aluminum	–	–	20100	68900
Arsenic	2.94	4.22	51.1	190
Barium	14.3	14.4	118	699
Beryllium	–	–	–	6.16
Cadmium	–	–	–	16.9
Calcium	27100	16600	5440	54100
Chromium	–	–	39.8	137
Cobalt	–	–	–	54.3
Copper	–	–	63.7	218
Iron	395	968	30700	139000
Lead	–	–	340	980
Magnesium	3940	3110	4340	21000
Manganese	114	228	317	2430
Nickel	–	–	31.1	136
Potassium	1670	3480	1540	7580
Selenium	–	–	–	3.82
Silver	–	–	–	16.7
Sodium	17700	20600	–	22600
Vanadium	–	–	45.6	142
Zinc	–	–	290	1350
Volatile Organic Compounds (ug/g Soil, ug/L Water)				
Halogenated Organics				
Methylene Chloride	–	2.6	–	–
Chloroform	–	–	–	–
1,1,1-Trichloroethane	–	–	–	–
Trichloroethene	11	–	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Phthalates				
Diethyl Phthalate	–	–	–	9.5
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)				
Polynuclear Aromatics				
Acenaphthylene	–	–	–	–
Fluorene	–	–	–	–
Phenanthrene	–	–	1.1	–
Fluoranthrene	–	–	1	–
Pyrene	–	–	2.1	–
Benzo (a) Anthracene	–	–	1.2	–
Chrysene	–	–	–	–
Benzo (b) Fluoranthene	–	–	–	–
Benzo (k) Fluoranthene	–	–	–	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-3
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSW-93-92E	SSW-93-92F	SSD-93-92G	SSW-93-92G
Field Sample ID	WX9205X1	WX9206X1	DX920700	WX9207X1
Lab Sample ID	UA02665	UA02679	UA02881	UA02875
Site Type	STRM	STRM	STRM	STRM
Sample Depth (ft)	0	0	0	0
QC Type				
Collection Date:	08-Sep-93	09-Sep-93	16-Sep-93	16-Sep-93
Pesticides/PCBs (ug/g Soil, ug/L Water)				
alpha-BHC	0.024	–	–	–
Dieldrin	–	–	0.019	–
Endosulfan Sulfate	–	–	–	–
p,p'-DDD	–	–	–	–
p,p'-DDE	–	–	0.021	–
p,p'-DDT	–	–	–	0.005
Water Quality Parameters				
pH	6.7	6.2	NA	NA
Conductivity (ms/cm)	0.22	0.2	NA	NA
Turbidity (NTU)	0	0	NA	NA
Dissolved Oxygen (mg/L)	8.4	2.8	NA	NA
Temperature (C)	16	18	NA	NA
Salinity (ppt)	0	0	NA	NA
Total Suspended Solids (ug/L)	–	–	NA	4300000
Hardness (ug/L)	82000	53000	NA	220000
Alkalinity (ug/L)	47000	27000	NA	11000
Nitrate/Nitrite (ug/L)	290	14.6	NA	163
Total Phosphorus (ug/L)	12	25.4	NA	1400
Total Kjedahl Nitrogen (ug/L)	155	534	NA	9900
Anions (ug/L)				
Chloride	28000	30000	NA	45000
Sulfate	10000	13000	NA	2600

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-4
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-93A DX930100 UA02706 STRM 0 10-Sep-93	SSW-93-93A WD9301X1 UA02739 STRM 0 Duplicate 10-Sep-93	SSW-93-93A WX9301X1 UA02738 STRM 0 10-Sep-93	SSD-93-93B DX930200 UA02676 STRM 0 09-Sep-93	SSD-93-93C DX930300 UA02677 STRM 0 09-Sep-93
Total Organic Carbon (ug/g)	32000	NA	NA	10000	31000
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	180	–	270	220	210
Inorganic Compounds (ug/g Soil, ug/L Water)					
Aluminum	11500	–	114	4530	6230
Arsenic	11	–	–	8.95	9.4
Barium	9.01	12.3	12.3	8.77	13.5
Boron	–	–	–	–	–
Calcium	1590	8050	8200	656	1400
Chromium	19.2	–	–	11.9	12.6
Cobalt	4.46	–	–	2.85	3.34
Copper	13.1	–	–	7.27	12.3
Iron	31300	376	397	11800	12900
Lead	32	–	5.74	17.4	19.6
Magnesium	4620	885	914	2320	2400
Manganese	269	259	273	189	228
Nickel	14.2	–	–	9.91	10.5
Potassium	367	1350	1420	356	535
Sodium	80.5	6030	6040	47.1	83.3
Vanadium	19.7	–	–	7.81	10.4
Zinc	60	57.5	55.8	36.6	48.1
Volatile Organic Compounds (ug/g Soil, ug/L Water)					
Aromatics					
Toluene	–	1.4	–	–	–
Halogenated Organics					
1,1,1-Trichloroethane	–	1.8	–	–	–
Water Solubles					
Acetone	–	–	25	–	–
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)					
Phthalates					
Di-n-butyl Phthalate	–	–	–	–	–
Bis (2-Ethyl hexyl) Phthalate	–	–	–	–	–
Polynuclear Aromatics					
Acenaphthylene	–	–	–	0.21	–
Phenanthrene	0.41	–	–	0.69	–
Fluoranthrene	0.39	–	–	0.61	–
Pyrene	0.97	–	–	0.74	–
Benzo (a) Anthracene	0.36	–	–	0.41	–
Chrysene	0.4	–	–	–	–
Benzo (b) Fluoranthene	–	–	–	–	–
Benzo (k) Fluoranthene	–	–	–	–	–
Pesticides/PCBs (ug/g Soil, ug/L Water)					
beta-BHC	–	0.02	0.021	–	–
Dieldrin	–	–	–	0.006	0.003
Heptachlor	–	0.008	0.008	–	–
Lindane	–	0.016	0.016	–	–
p,p'-DDD	0.03	0.009	0.013	0.013	0.018
p,p'-DDE	0.005	–	–	0.003	0.014
p,p'-DDT	0.015	0.011	0.016	0.015	0.03

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-4
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-93A DX930100 UA02706 STRM 0 10-Sep-93	SSW-93-93A WD9301X1 UA02739 STRM 0 Duplicate 10-Sep-93	SSW-93-93A WX9301X1 UA02738 STRM 0 10-Sep-93	SSD-93-93B DX930200 UA02676 STRM 0 09-Sep-93	SSD-93-93C DX930300 UA02677 STRM 0 09-Sep-93
Water Quality Parameters					
pH	NA	5.9	NA	NA	NA
Conductivity (ms/cm)	NA	0.08	NA	NA	NA
Turbidity (NTU)	NA	0	NA	NA	NA
Dissolved Oxygen (mg/L)	NA	3.7	NA	NA	NA
Temperature (C)	NA	20	NA	NA	NA
Salinity (ppt)	NA	0	NA	NA	NA
Total Suspended Solids (ug/L)	NA	9000	6000	NA	NA
Hardness (ug/L)	NA	23000	24000	NA	NA
Alkalinity (ug/L)	NA	11000	14000	NA	NA
Nitrate/Nitrite (ug/L)	NA	710	760	NA	NA
Total Phosphorus (ug/L)	NA	55	55.9	NA	NA
Total Kjedahl Nitrogen (ug/L)	NA	518	561	NA	NA
Anions (ug/L)					
Chloride	NA	5460	6350	NA	NA
Sulfate	NA	17000	14000	NA	NA

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-4
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID	SSD-93-93D	SSD-93-93E	SSW-93-93E
Field Sample ID	DX930400	DX930500	WX9305X1
Lab Sample ID	UA02678	UA02705	UA02737
Site Type	STRM	STRM	STRM
Sample Depth (ft)	0	0	0
QC Type			
Collection Date:	09-Sep-93	10-Sep-93	10-Sep-93
Total Organic Carbon (ug/g)	5400	17000	NA
Total Petroleum Hydrocarbons (ug/g Soil, ug/L Water)	2700	190	420
Inorganic Compounds (ug/g Soil, ug/L Water)			
Aluminum	4500	5120	195
Arsenic	3.65	10.6	–
Barium	14.6	13.5	15.7
Boron	–	–	377
Calcium	2060	1190	23700
Chromium	20.4	12.6	–
Cobalt	–	–	–
Copper	15.9	6.66	–
Iron	8380	10400	3810
Lead	16.6	19.1	5.27
Magnesium	1670	2770	3960
Manganese	84.1	92.5	236
Nickel	7.44	12.5	–
Potassium	683	521	2200
Sodium	155	69.7	25600
Vanadium	9.87	9.03	–
Zinc	59.9	36.7	–
Volatile Organic Compounds (ug/g Soil, ug/L Water)			
Aromatics			
Toluene	–	–	–
Halogenated Organics			
1,1,1-Trichloroethane	–	–	1.3
Water Solubles			
Acetone	–	–	27
Semivolatile Organic Compounds (ug/g Soil, ug/L Water)			
Phthalates			
Di-n-butyl Phthalate	1.7	–	–
Bis (2-Ethyl hexyl) Phthalate	1.6	–	–
Polynuclear Aromatics			
Acenaphthylene	0.14	–	–
Phenanthrene	0.57	–	–
Fluoranthrene	0.76	0.15	–
Pyrene	1.2	0.39	–
Benzo (a) Anthracene	0.87	–	–
Chrysene	0.94	–	–
Benzo (b) Fluoranthene	0.83	–	–
Benzo (k) Fluoranthene	0.78	–	–
Pesticides/PCBs (ug/g Soil, ug/L Water)			
beta-BHC	–	–	–
Dieldrin	0.005	–	–
Heptachlor	–	–	–
Lindane	–	–	–
p,p'-DDD	0.003	0.013	–
p,p'-DDE	–	0.007	–
p,p'-DDT	–	–	–

Notes:
NA = Not Analyzed
GT = Greater than detection limit

Table 2-4
Fort Devens BRAC EE Study
Study Area: AREE70

Site ID Field Sample ID Lab Sample ID Site Type Sample Depth (ft) QC Type Collection Date:	SSD-93-93D DX930400 UA02678 STRM 0 09-Sep-93	SSD-93-93E DX930500 UA02705 STRM 0 10-Sep-93	SSW-93-93E WX9305X1 UA02737 STRM 0 10-Sep-93
Water Quality Parameters			
pH	NA	NA	6.2
Conductivity (ms/cm)	NA	NA	0.26
Turbidity (NTU)	NA	NA	2
Dissolved Oxygen (mg/L)	NA	NA	1.5
Temperature (C)	NA	NA	20
Salinity (ppt)	NA	NA	0
Total Suspended Solids (ug/L)	NA	NA	14000
Hardness (ug/L)	NA	NA	74000
Alkalinity (ug/L)	NA	NA	54000
Nitrate/Nitrite (ug/L)	NA	NA	42.3
Total Phosphorus (ug/L)	NA	NA	88.2
Total Kjedahl Nitrogen (ug/L)	NA	NA	1400
Anions (ug/L)			
Chloride	NA	NA	35000
Sulfate	NA	NA	6640

Notes:
NA = Not Analyzed
GT = Greater than detection limit

3.0 Conclusions and Recommendations

The River Evaluation conducted as part of the AREE 70 evaluation was designed to evaluate whether the storm sewer systems on Fort Devens act as potential pathways for introducing contaminants to the river/brooks. Target analytes were selected for analysis. However, all analytes were reviewed to identify any potential contaminants not identified as a target analyte. Trends identified potential areas with elevated target analytes. From these trends, potential contaminant sources were identified.

Conclusions and recommendations regarding the northern and central Nashua River, Cold Spring Brook, and Willow Brook are addressed in the following sections.

3.1 Nashua River, Northern Section

Due to the limited nature and extent of the contamination detected in the northern section of the Nashua River, no further action is recommended. Metals and semivolatile organic analytes were detected at low concentrations and did not show any significant trends. The elevated levels of TPH and SVOCs in sample SSD-93-90A may be correlated with road runoff from the bridge. No other specific sources can be identified for this sample point. All storm sewer outfalls with the exception of system #54 do not have distinct discharges or drainage channels to the Nashua River.

The organic acids detected in sample G6D-92-01X were tentatively identified as possible constituents of cleaning agents. However the same compounds analytically classified as "unknown compounds" were also detected in other field samples collected on the same day but were not present in the laboratory quality control sample. These cleaning agents are most likely attributable to either cross contamination from field sampling equipment or laboratory contamination. These organic acids were not detected in other samples along the river. Furthermore, the sample location for G6D-92-01X is not near specific outfall locations and cannot be readily associated with storm drains in the vicinity. The data within this AREE 70 report should be used as a reference and support for potential future studies, if any, involving this section of the river.

3.2 Nashua River, Central Section

The nature and extent of the contamination within the central section of the Nashua River appears to be linked to current and historical land use adjacent to the river. The occurrence of SVOCs, TPH, and elevated concentrations of metals in the southern central portion of the river would be consistent with runoff from Route 2. In addition, the elevated concentrations of metals detected in sample SSD-93-91A may be from road runoff from West Main Street. The central section of this portion of the river is to undergo further sampling as part of AOC 11. The analyte peaks identified in this evaluation are consistent with the known potential sources of contamination (bridge overpasses and AOC-11). No clear contaminant trend was identified for the detected analytes at this section of the river. The data contained in the AREE 70 report should

be used as a source of reference and in support of future studies, if any, involving this section of the river.

3.3 Cold Spring Brook

The analytes evaluated in Cold Spring Brook increased in concentration downstream of sample SSD-93-92D. This location correlates with the boundary of the industrial area on Barnum Road. The Storm Sewer System Evaluation (AREE 70) Report recommends additional sampling downgradient of each storm sewer outfall from the industrial area. This sampling is recommended to further characterize the nature and extent of potential contamination identified in these storm sewer systems.

The following conclusions and recommendations apply to Cold Spring Brook:

- Sample G3D-92-01X was collected near the outfall of system #6, and is possibly consistent with SA 57 (Area #1). The outfall from system #6 is recommended for further sampling (see AREE 70 Report) to determine the extent of contamination. The data presented in this Addendum should be used to support this sampling.

- The elevated concentrations of TPH associated with sample SSD-93-92G are possibly consistent with SA 57 (Area #2), which is undergoing a removal action.

- The elevated concentrations of lead, zinc, arsenic, and chromium at sample G3D-92-01X cannot be associated with a specific storm system because of the sample location. Further sampling is recommended at this sample location to verify the concentrations of these metals.

- The elevated concentrations of benzo(a)anthracene, benzo(a)pyrene, and phenanthrene in sediments at sample G3D-92-03X are possibly associated with the SVOCs detected in system #3. The AREE 70 Report recommends additional sampling downstream of the system #3 outfall to determine the nature and extent of contamination. The data presented in this Addendum should be used to support this sampling.

3.4 Willow Brook

The chemical analysis results from the samples collected from Willow Brook indicate one area with elevated analytes. There were slightly elevated concentrations of SVOCs within sediment. These elevated concentrations may be associated with systems #20 and #21. It is recommended that further sampling be conducted upstream and downstream of sample location SSD-93-93D to determine the nature and extent

of these compounds. The sampling effort should be coordinated with the additional sampling recommended for system #21 in the AREE 70 Report. No elevated concentrations of metals and no VOCs were detected. The concentrations of metals detected at sample SSD-93-93A are very low and do not correlate with the concentrations of metals in system #23. Only trace concentrations of pesticides were detected in Willow Brook. As a result, no additional potential contaminant sources were identified.